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TAXONOMY OF *APIASTRUM*, *AMMOSELINUM*, AND *SPERMOLEPIS* (APIACEAE)

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ABSTRACT

A taxonomic summary is given for the three closely related and primarily North American genera *Apiastrum* (1 species), *Ammoselinum* (3 species), and *Spermolepis* (11 species). Apiastrum includes the single species *A. angustifolium*, which occurs in California, Baja California, and Baja California Sur. Ammoselinum includes *A. rosengurtii* (endemic to Uruguay) and the North American *A. butleri* and *A. popei*. Spermolepis includes one species endemic to the Hawaiian Islands—*S. hawaiiensis*, one species endemic to Argentina—*S. castellanosii*, and nine species native to North America: *S. echinata*, *S. inermis*, **Spermolepis organensis** Nesom, **sp. nov.** (Dona Ana Co., New Mexico), **Spermolepis laevis** Nesom, **sp. nov.** (central Texas to south-central Oklahoma), *S. divaricata*, **Spermolepis** (Leptocaulis) **diffusa** (Nutt. ex DC.) Nesom, **comb. nov.**, **Spermolepis** (Ammoselinum) **gigantea** (Coulter & Rose) Nesom, **comb. nov.**, **Spermolepis lateriflora** Nesom, **sp. nov.** (California, Arizona, New Mexico, Texas, Chihuahua, and Sonora), and **Spermolepis infernensis** Nesom, **sp. nov.** (San Diego Co., California). Species descriptions and keys to the genera and species are provided and a discussion of inflorescence architecture points out distinctions within and among the genera; most of the species are illustrated by photos of specimens. An epitype is designated for *Spermolepis hawaiiensis*; lectotypes are designated for *Apiastrum latifolium* (a synonym of *Apiastrum angustifolium*), *Ammoselinum popei*, *Ammoselinum castellanosii*, *Ammoselinum* sect. *Hesperoselinum*, the genus *Leptocaulis* (a synonym of *Spermolepis*), and *Spermolepis* (Leptocaulis) *diffusa*.

KEY WORDS: *Apiastrum*, *Ammoselinum*, *Spermolepis*, Apiaceae, inflorescence architecture

The genera *Apiastrum*, *Ammoselinum*, and *Spermolepis* are very similar among themselves and are all placed in tribe Selineae (Downie et al. 2010) of subfamily Apioideae. The species are primarily North American but *Ammoselinum* and *Spermolepis* each include a South American species and *Spermolepis hawaiiensis* is endemic to Hawaii. The monospecific *Apiastrum* is restricted to Pacific coastal region of Mexico (Baja California and Baja California Sur) and California. Plants of *Ammoselinum* and *Spermolepis* are annuals with narrow, characteristically linear to filiform leaf segments, narrow involucel bractlets but lacking an involucre, white petals with straight apices, laterally compressed fruits, narrowly conical stylopodium, and styles absent, the sigmas divergent. *Apiastrum* is similar but apparently is specialized in its lack of sepals, stylopodium, and involucel bractlets and its branching-inflorescence architecture. Loss of peduncles has occurred in some species of all three genera.

1. Medial and distal leaves appearing opposite; schizocarps depressed-ovoid, 1–1.5 mm; sepals absent; stylopodium obsolete, styles filiform; involucel bractlets absent ..... **Apiastrum**
1. Leaves alternate; schizocarps broadly ovoid to ovoid-oblong, urceolate-ovoid, or urceolate-oblong, 1.5–5 mm; sepals small but present; stylopodium present, styles obsolete; involucel bractlets present.

    2. Schizocarp ovoid-oblong to urceolate-ovoid or broadly ellipsoid, ribs sparsely to densely scaberulous with single-celled papilla-like projections ..... **Ammoselinum**
    2. Schizocarp broadly ovoid to ellipsoid or elliptic-ovoid, ribs and intervals variously hairy or at least tuberculate ..... **Spermolepis**

In maintaining *Ammoselinum* and *Spermolepis* as separate genera in the present manner, the definition of *Ammoselinum* is narrowed to only the three species with mericarps scabrous-ribbed, otherwise glabrous, and with corky-expanded, appendage-like lateral ribs (Fig 1). Those species without expanded lateral ribs and with hairs or at least tubercles on both the ribs and intervals are referred to *Spermolepis*.

Considerable variation in fruit shape and vestiture also exists among the species of *Spermolepis* as accepted here (Fig. 1a-q). *Spermolepis gigantea* and *S. castellanosii* appear to be distinct as a pair on the basis of the relatively elongate fruits (compared to other species of *Spermolepis*), but *S. gigantea* is unique in its hispid-hirsutulous fruit vestiture with long, sharp-pointed hairs without tuberculate bases; hairs of *S. castellanosii* are similar to those of *S. infernensis*. *Spermolepis divaricata* and *S. diffusa* are distinct as a pair on the basis of their short-ellipsoid fruits with tiny upcurved hairs; they also are distinct from the rest of the genus in their relatively smooth epidermis (vs. minutely "bubbly" in the others). *Spermolepis echinata*, *S. hawaiiensis*, *S. lateriflora*, *S. infernensis*, and *S. inermis* are similar in their broadly ovoid fruits with multicellular, tuberculate trichome bases and the first three species are echinate-bristly with apically hooked hairs.

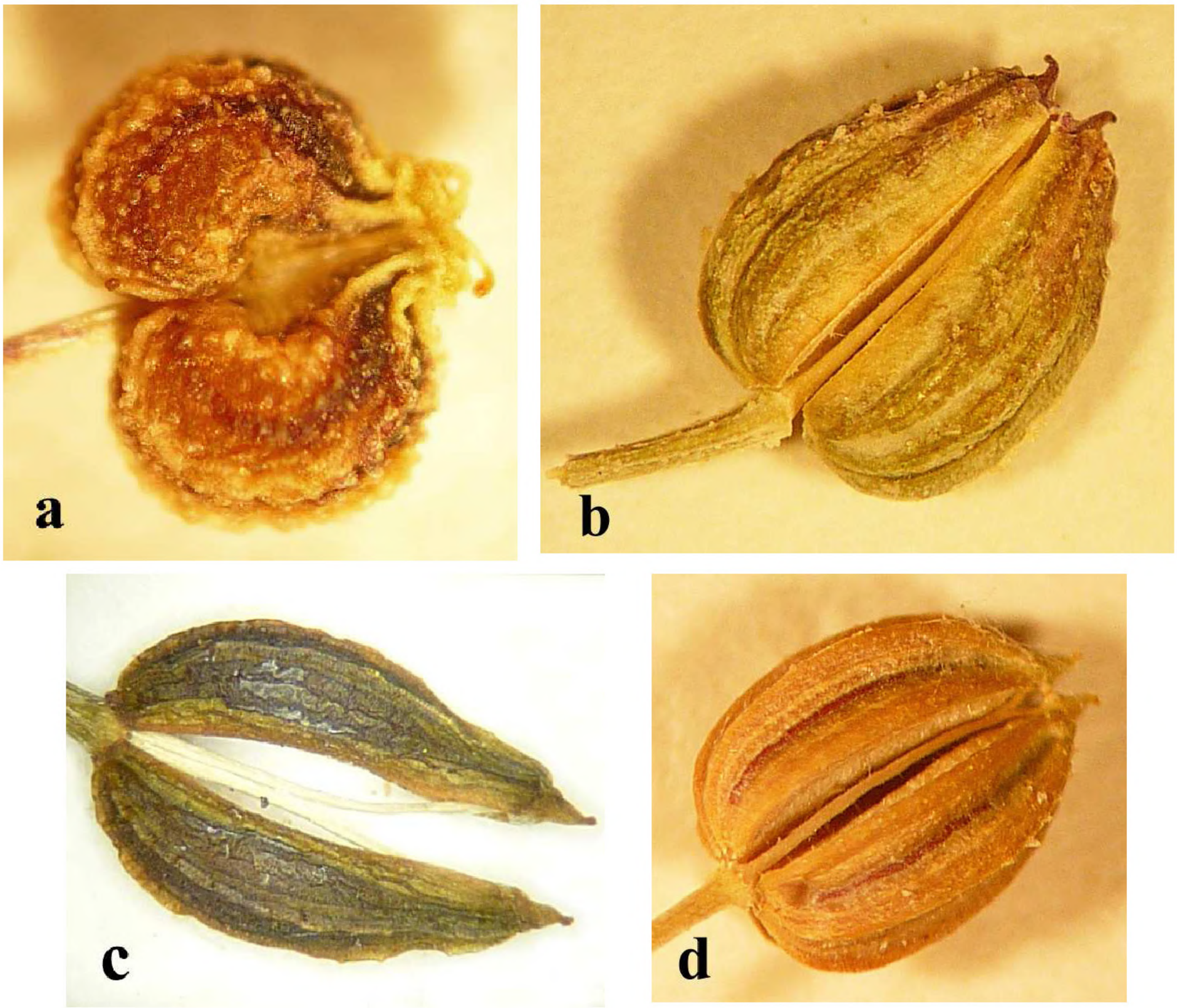


Figure 1a–u. Mature or near-mature fruits of *Apiastrum*, *Ammoselinum*, and *Spermolepis*. At approximately but not exactly the same scale (see descriptions for measurements). (a) *Apiastrum angustifolium*, (b) *Ammoselinum popei*, (c) *Ammoselinum rosengurtii*, (d) *Ammoselinum butleri*.

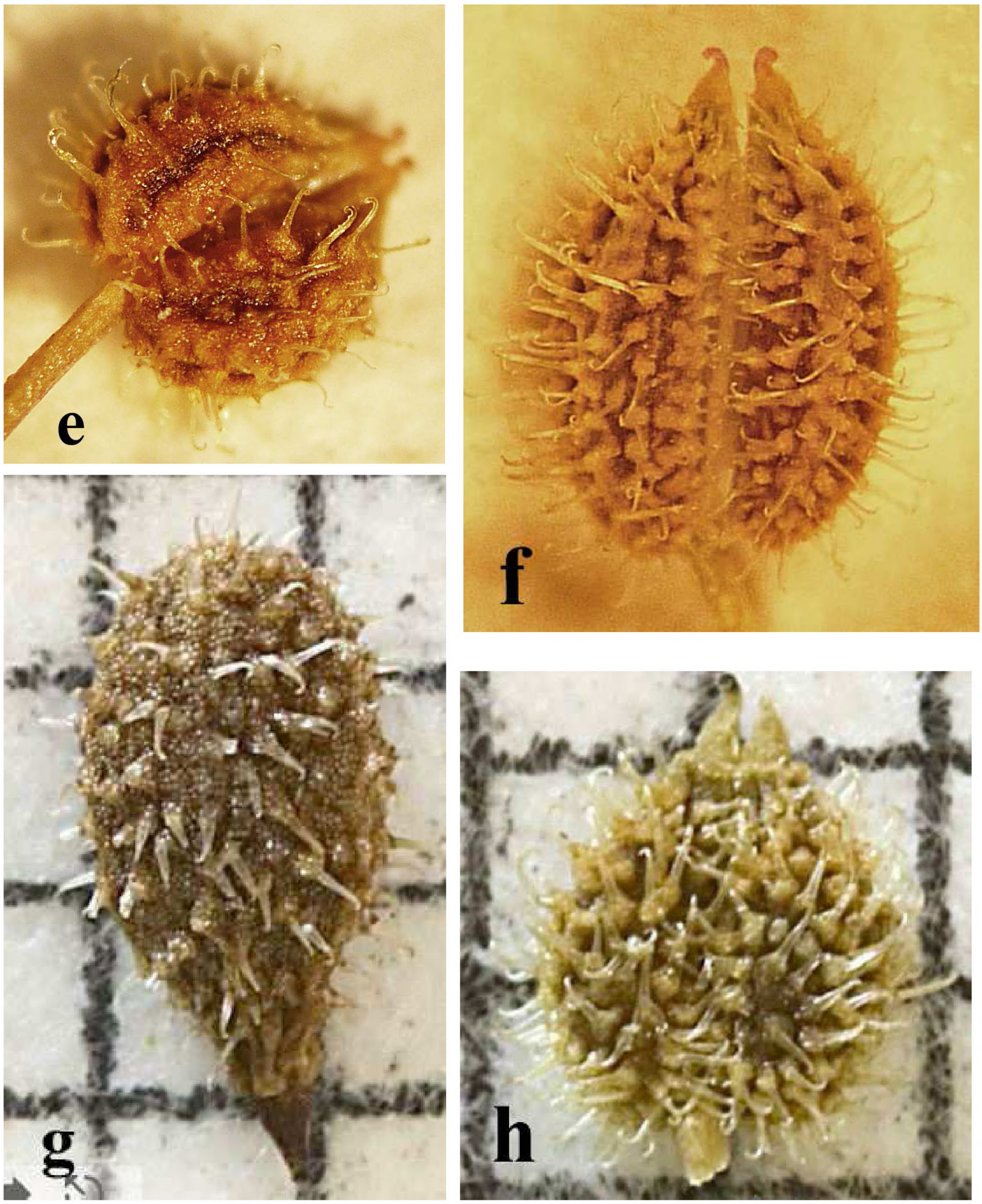


Figure 1e, f, g, h. (e) *Spermolepis echinata*, (f) *S. lateriflora*, (g, h) variants of *S. hawaiiensis*.

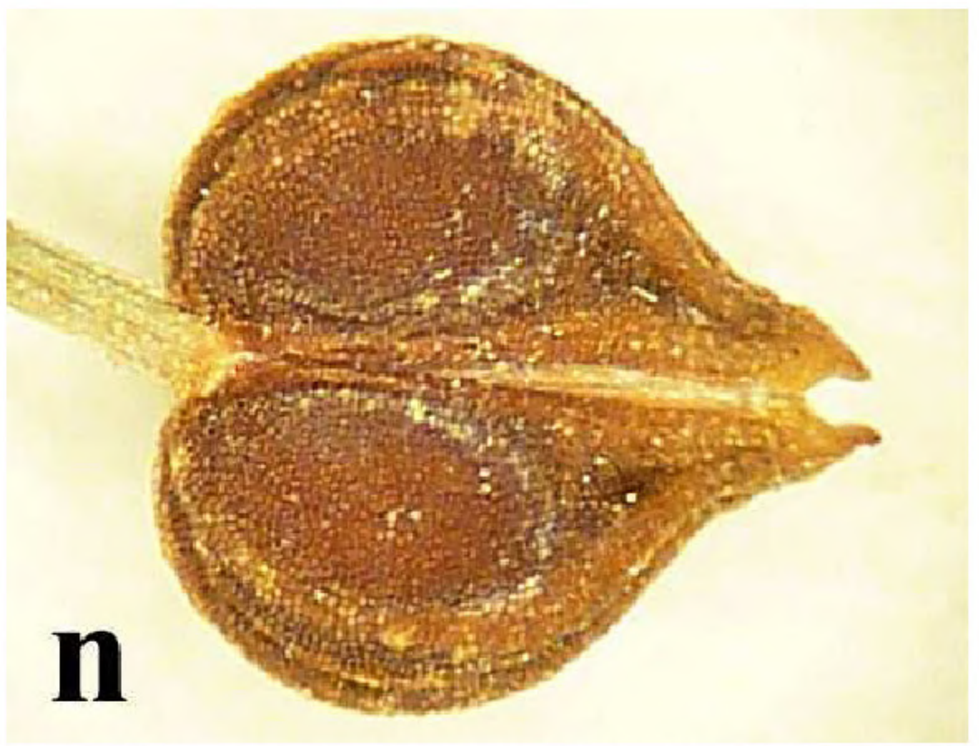
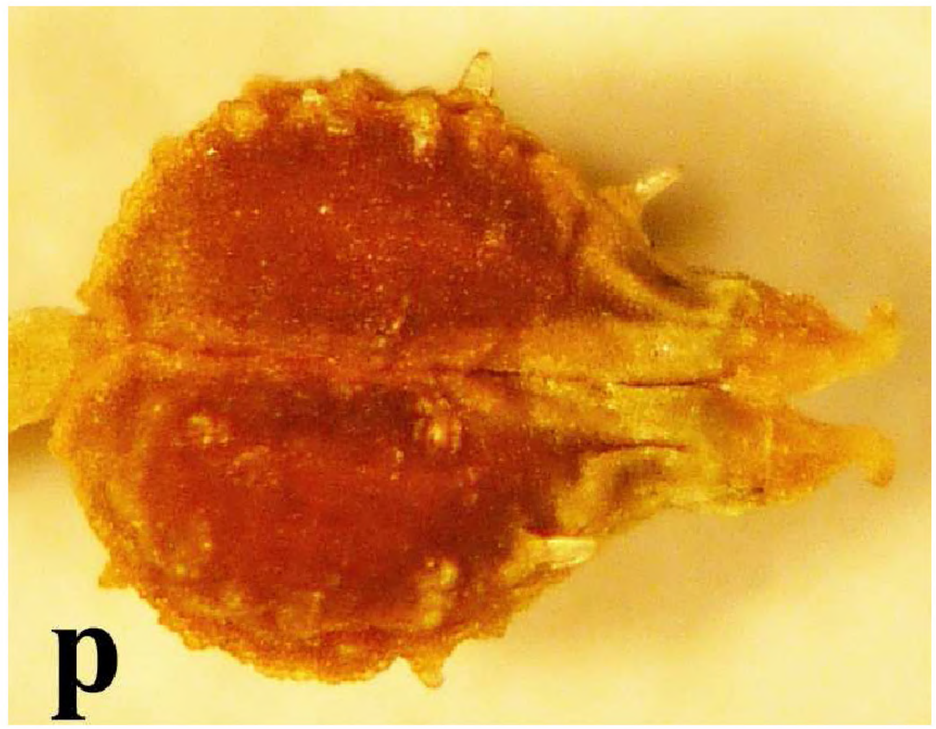
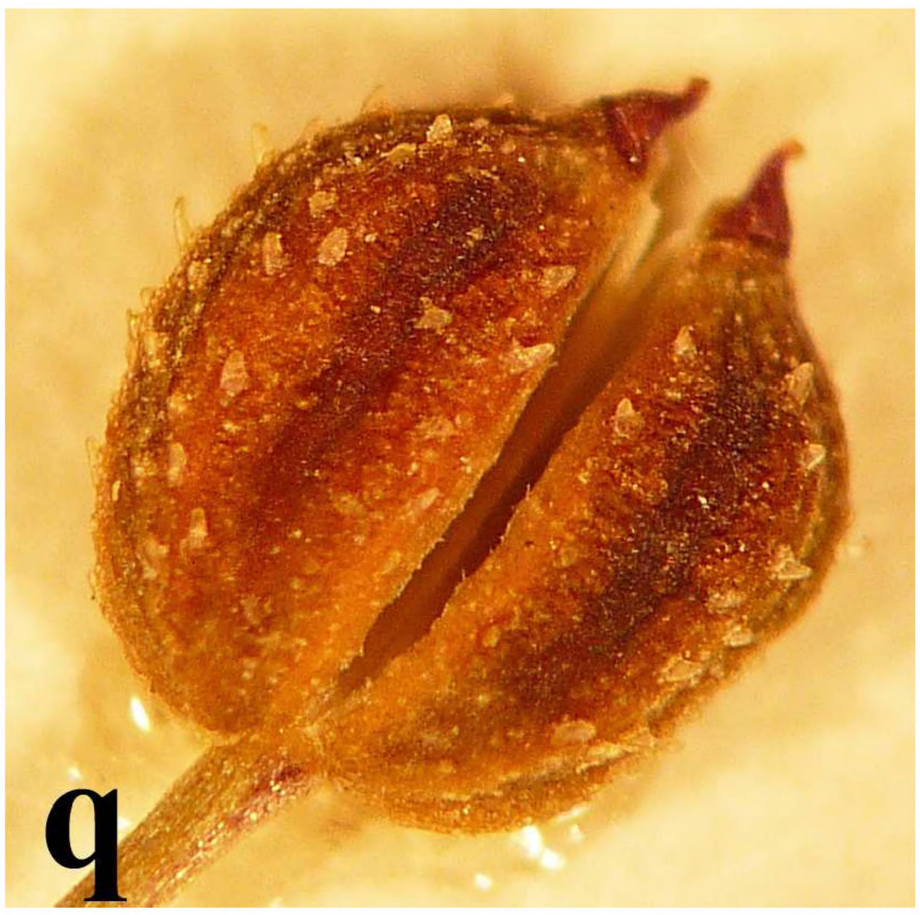


Figure 1i, j, k, l, m, n. (i) *Spermolepis echinata* variant, possibly mutant, Whitehouse 9828, from Wilbarger Co. Tex., see text (j) *S. echinata* x *S. inermis*?, Cory 48795, from Wilson Co. Tex., see text, (k) *S. infernensis*, (l) *S. organensis* , (m) *S. inermis*, (n) *S. laevis*.





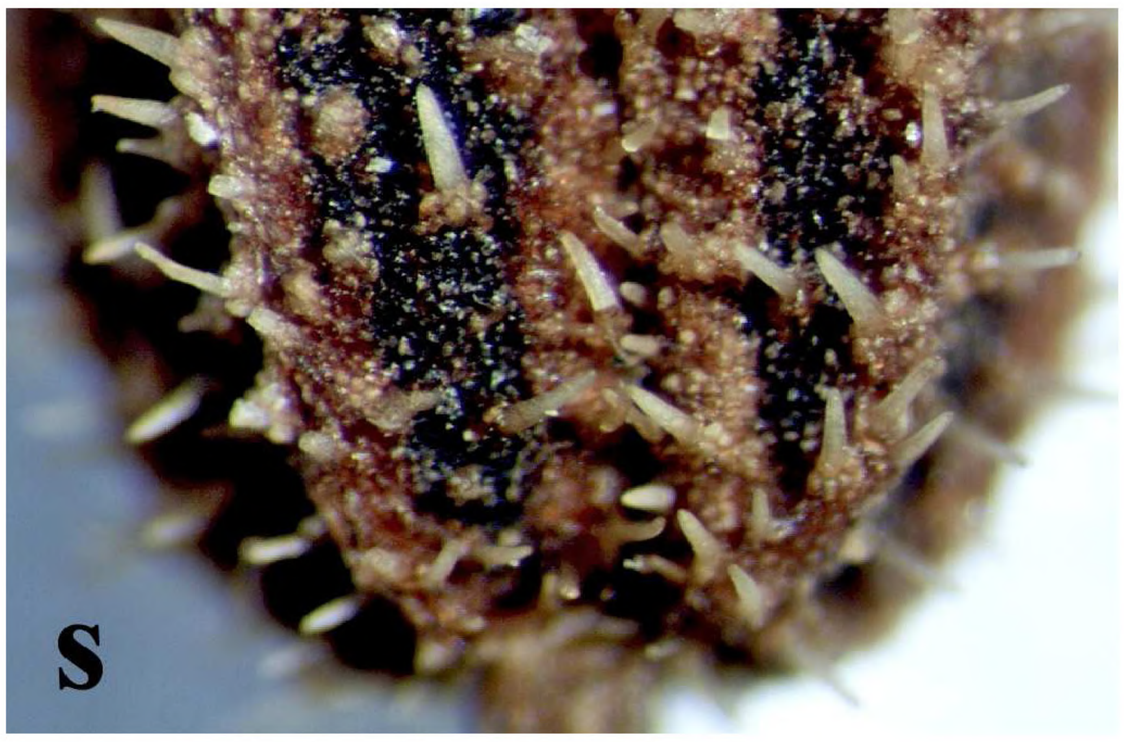


Figure 1o, p, q, r, s, t. (o) *Spermolepis laevis* variant with slightly rugulate ribs and intervals - *Wolff 2102*, (p) *S. laevis* variant with a few tubercles, some with short, blunt-tipped hairs - *Whitehouse 18439*, (q) *S. divaricata*, (r) *S. diffusa*, (s, t) *S. castellanosii*.

Figure 1u. *Spermolepis gigantea* (at much larger scale than the other fruit photos).

Among the genera of tribe Selineae in the account by Downie et al. (2010), *Oligocladus* Chodat & Wilczek is the only other American genus in the tribe outside of the "*Arracacia* Clade" and the "Perennial Endemic North American Clade" — except for *Ammoselinum* and *Spermolepis*, all other genera are Eurasian. *Oligocladus* includes only the single species *O. patagonicus* (Speg.) Pérez-Mor. (synonym = *O. andinus* Chodat & Wilczek), which apparently is restricted to Argentina. Mainly because of its dorsally compressed fruits (flattened parallel with the plane of the commissure) with numerous oil tubes on the broad commissural face, Mathias and Constance (1950) eliminated *Oligocladus* as a possible congener or even close relative when considering the generic placement of their new species *Ammoselinum rosengurtii* (see illustrations of *O. andinus* in Chodat and Wilczek 1902, pp. 527–528, vs. lateral compression in the *Apiastrum-Ammoselinum-Spermolepis* group, flattened perpendicular to the plane of the commissure).

The base chromosome number of the *Apiastrum*, *Ammoselinum*, and *Spermolepis* group appears to be x = 11, as it appears in all three genera, with reductions to x = 10 and x = 8. Among the uncinate-bristly species of *Spermolepis*, three dysploid levels exist: $2n = 22$ (*S. hawaiiensis*), $2n = 20$ (*S. echinata*), and $2n = 16$ (*S. lateriflora*). If the uncinate-bristly species represent a single clade, then the dysploid changes appear to be more indicative of individual speciation events that consistent

indicators of cladistic relationships. Interesting research remains to be done with regard to chromosome numbers (see comments following *S. divaricata*).

A close relationship among the 13 species of *Apiastrum*, *Ammoselinum*, and *Spermolepis* is suggested by morphological similarities as well as their general geographic coherence in a broad region (North America, South America) where other potentially related species apparently do not exist. It would not be indefensible to treat all 13 species within a single genus.

Branching pattern and umbel architecture

In all species of *Ammoselinum* except one and in two species of *Spermolepis*, umbels are borne on ebracteate peduncles that appear to originate only at leaf axils (Fig. 2A). Growth is indeterminate, as upward vegetative growth is continued even at the distalmost node. In these plants, however, the peduncle appears to be the extension of the primary ("pr") stem axis. Continued upward stem growth and production of additional umbels continues from growth of the axillary ("ax") bud. In this interpretation, the umbels actually are produced as terminal structures, rather than axillary ones.

In *Ammoselinum butleri*, *Spermolepis lateriflora*, and *S. infernensis*, the peduncle is absent (presumably suppressed) and the umbellet rays appear to arise from the leaf axils (Fig. 2C). The axillary bud in these plants apparently is suppressed at the distalmost node, so that growth may be characterized as determinate. Peduncle suppression is complete in *A. butleri* but in *S. lateriflora*, apparently over its whole geographic range, some plants produce pedunculate umbels from nodes below the distalmost (see Figures 7 and 8 and examples cited below, under the species).

In *Spermolepis divaricata*, *S. diffusa*, and *S. inermis*, the primary axis at each node forms a peduncle and compound umbel, but on the branch arising from the distalmost axillary bud, both the terminal leaf and the axillary bud are suppressed (Fig. 2B). In effect, each branch terminates in two compound umbels and growth may be characterized as determinate.

In *Apiastrum angustifolium*, leaves appear to be opposite and two branches and two sessile (compound) umbels arise at each node (Fig. 2D). In the interpretation here, this arises from (a) suppression of the peduncles, (b) complete foreshortening of the distal internode that would constitute the axillary axis, and (c) duplication of the axillary bud in order that growth continues from two upward branches. Axillary buds apparently are suppressed at the distalmost node and growth may be characterized as determinate.

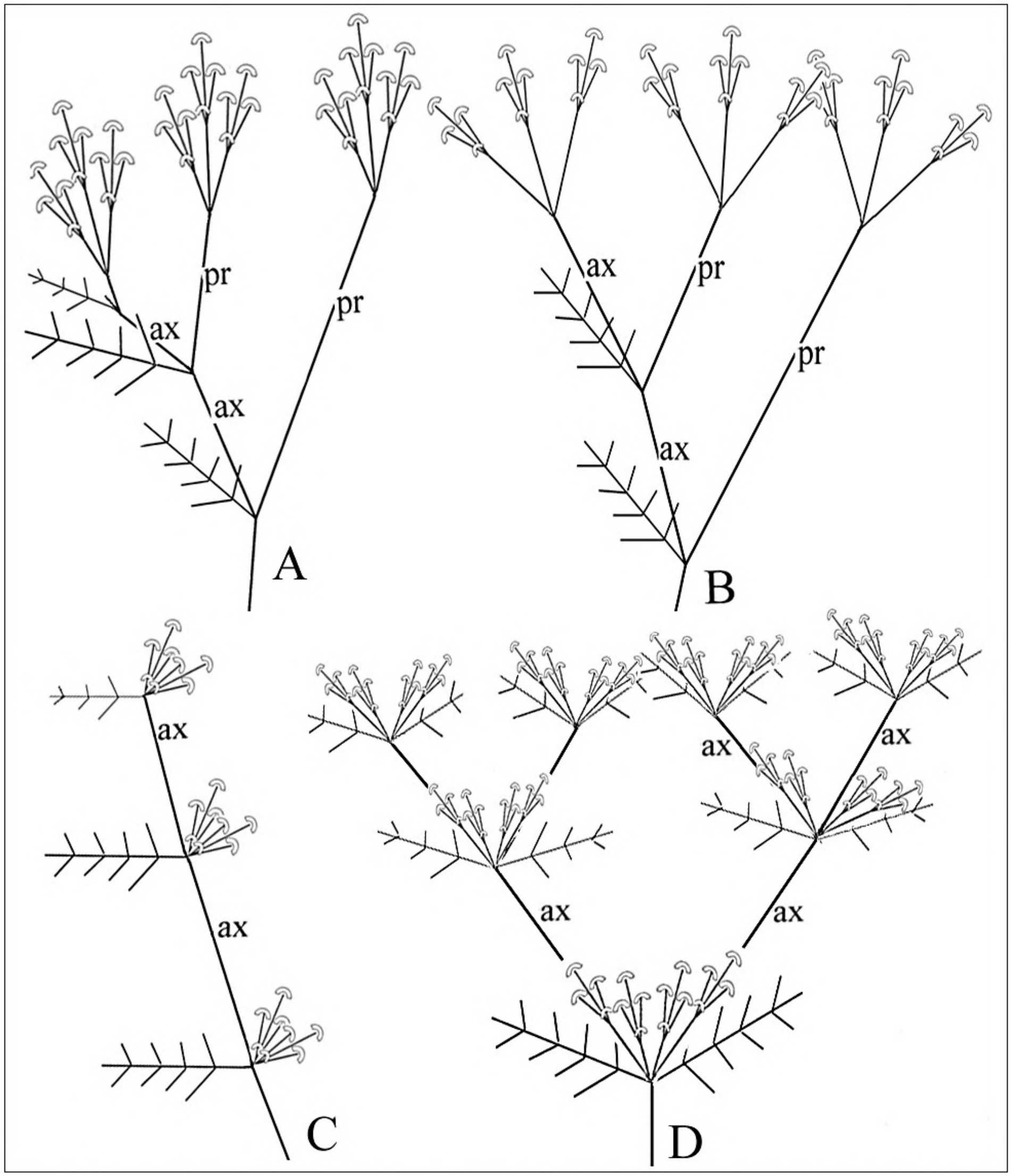


Figure 2. Variation in inflorescence architecture in *Ammoselinum*, *Apiastrum*, and *Spermolepis*. **A**. Pedunculate-axillary-indeterminate: *Ammoselinum popei*, *Ammoselinum rosengurtii*, *Spermolepis echinata*, *S. hawaiiensis*, *S. castellanosii*. **B**. Pedunculate-axillary-determinate: *Spermolepis divaricata*, *S. diffusa*, *S. inermis*, *S. laevis*, *S. organensis*, *S. gigantea*. **C**. Sessile-axillary-determinate: *Ammoselinum butleri*, *Spermolepis lateriflora*, *S. infernensis*. **D**. Sessile-dichotomous-determinate: *Apiastrum angustifolium*. "ax" = axillary branch, arising from the axillary bud. "pr" = primary branch, continuing from the main branch from below. In determinate arrangements, the axillary bud is suppressed at the distalmost node.

APIASTRUM Nutt. ex Torr. & A. Gray, Fl. N. Amer. 1: 643. 1840. **TYPE**: *Apiastrum angustifolium* Nutt. ex Torr. & A. Gray

Herbs, annual, with odor, 0.4–5 dm, glabrous; taproot slender. **Leaves** appearing opposite to subopposite medially and distally; basal and cauline 3-4 ternately compound; blades broadly ovate to ovate in outline, herbaceous; leaflets divided, ultimate divisions linear to narrowly oblong, margins entire; petioles scarious margined at base, distal petioles foreshortened and scarious-margined along whole length. **Umbels** compound, loosely convex, axillary, sessile (rays appearing to arise from leaf axils), peripheral flowers not different; involucral bracts absent; involucel bractlets absent. **Pedicels** present. **Flowers** bisexual; sepals absent; petals white, margins, entire, apices slightly inflexed; stylopodium depressed-reduced, nearly obsolete; styles evident, filiform, 0.2 mm, arching-divergent. **Schizocarps** depressed-ovoid [mericarps reniform], laterally compressed, not beaked, splitting, ribs 3, barely raised, mostly delimited by line of papillae, oil tubes 1 per interval, filiform not filling the interval, surface shallowly tuberculate, otherwise glabrous; carpophore bifid the whole length. **Base chromosome number**, x = 11.

1. **Apiastrum angustifolium** Nutt. ex Torr. & A. Gray, Fl. N. Amer. 1(4): 644. 1840. **TYPE: USA. California**. [San Diego Co.:] St. Diego, N Cal, April, *T. Nuttall s.n.* (probable holotype: GH 00075076; isotypes: K digital image!, PH 01015720 digital image!).

Apiastrum angustifolium var. *tenellum* Nutt. ex Torr. & A. Gray, Fl. N. Amer. 1(4): 644. 1840. **TYPE: MEXICO. Baja California**. Cerro [Cedros] Island, Mar 1889, *E. Palmer s.n.* (probable holotype: PH 743994 digital image!).

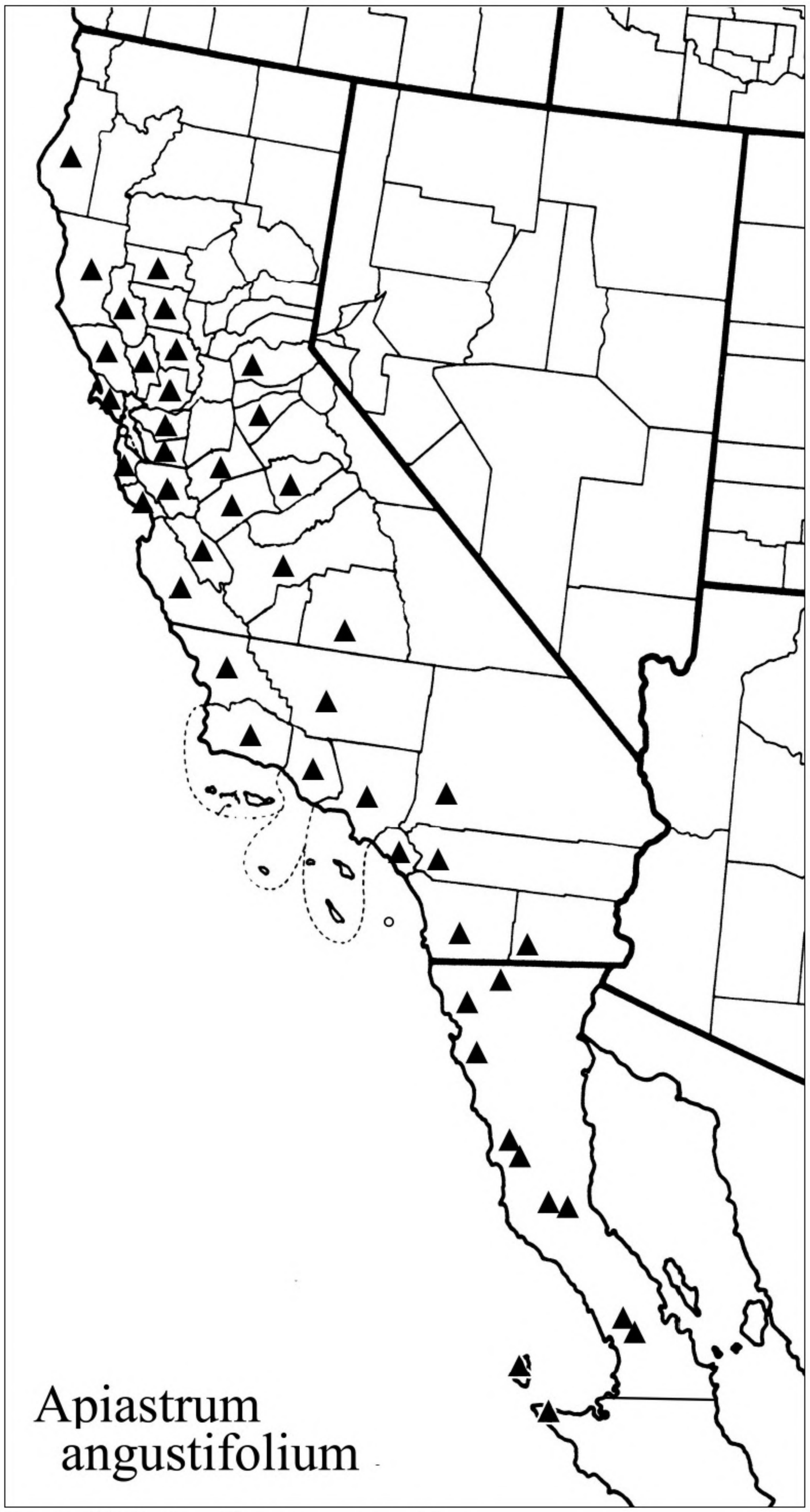
Torrey and Gray did not indicate that they saw a collection; their concept of the taxon was from Nuttall's manuscript. The plant in the PH collection matches Torrey and Gray's brief description ("stem dichotomous from the base; leaves less divided; rays of the umbel very slender; umbellets 1–2-flowered; seed more rugulose").

Apiastrum latifolium Nutt. ex Torr. & A. Gray, Fl. N. Amer. 1(4): 644. 1840. **LECTOTYPE** (designated here): **USA. California**. [Santa Barbara Co.:] "St. Barbara, N Cal." [on PH sheet], no other collection data, *T. Nuttall s.n.* (GH 00075075; isolectotype: PH 01044838 digital image!). Torrey and Gray cited "Nuttall! Douglas!"

Helosciadium leptophyllum var. ? *latifolium* Hook. & Arn., Bot. Beechey Voy., 347. 1838. No collection was cited (pp. 347–348). The protologue gave only this: "The specimens are only in young fruit, and the segments of the upper leaves are considerably broader than in any form we have yet seen, while even the lower ones are broader than in *H. laciniatum*, DC., which we consider a mere variety of this species." As synonym of *Apiastrum* fide Mathias and Constance (1945).

Stems 4–50 cm. **Leaves**: blades 1–5 cm, ultimate segments 5–25 mm; petioles 20–40 mm. **Peduncles** absent. **Umbels** axillary only: involucre bracts absent; involucel bractlets absent; fruiting rays 2–5 per node (2 umbels per node), (0–)7–25(–50) mm (central umbellet sessile); umbellets 3–7 flowered; fruiting pedicels (0–)2–8(–15) mm (central 1–2(–3) flowers sessile), unequal, spreading. **Schizocarps** 1–1.5 mm. $2n = 22$ (San Diego Co. – 2 counts, Bell & Constance 1957; Baja California, Constance et al. 1976). Map 1. Figure 3.

Flowering Mar–Apr. Chaparral, coastal sage scrub, blue oak savanna, rock outcrops, granite slopes, shale slopes, serpentine soil, steep slopes, recently burned areas, grassy openings, roadsides; 0–400(–1500) m. Calif.; Mexico (Baja California, Baja California Sur).



Map 1. Distribution of *Apiastrum angustifolium*.

AMMOSELINUM Torrey & A. Gray, Pacif. Railr. Rep. 2(4): 165. 1855 [1857]. **TYPE:** *Ammoselinum popei* Torrey & A. Gray

Herbs, annual, odorless or "faintly *Pastinaca*-scented" in *A. giganteum*, 0.4–3.5 dm, glabrous but stem ridges distally scaberulous; taprooted. **Leaves** all alternate; basal 3-ternately compound, cauline 2–3-ternately compound; blades broadly ovate to obovate, herbaceous; leaflets lobed or divided, leaflets and ultimate divisions linear to oblanceolate or subspatulate, margins entire; petioles scarious margined at base, distal petioles foreshortened and scarious-margined along whole length. **Umbels** compound, loosely convex, axillary, pedunculate (rays borne on an ebracteate portion of stem) or sessile (rays appearing to arise from leaf axils), peripheral flowers not different; involucral bracts absent; involucel bractlets distinct, linear, entire or less commonly 2–3-fid, herbaceous. **Pedicels** present. **Flowers** bisexual; sepals obsolete or greatly reduced and barely evident; petals white, margins entire; stylopodium narrowly conical; styles obsolete, stigmas directly atop stylopodium and divergent. **Schizocarps** ovoid-oblong to urceolate-ovoid or broadly ellipsoid, 2–5.3 mm, laterally flattened, base shallowly rounded to truncate, apex not beaked, mericarps splitting, dorsal ribs 3, corky-thickened or thin, lateral corky-thickened with an appendage-like growth incurving over the commissure, dorsal oil ducts 1 or 3 per interval, 1 or 2 on the commissure, ribs scaberulous with rounded to blunt single-celled, irregular, papilla-like projections; commissure sulcate; carpophore bifid only distally or along the whole length. **Base chromosome number**, x = 11.

KEY TO THE SPECIES

1. Umbels epedunculate (sessile, rays appearing to arise from leaf axils); schizocarps 2–2.2 mm, dorsal ribs acute ..... 1. **Ammoselinum butleri**
1. Umbels pedunculate (rays borne on an ebracteate portion of stem); schizocarps 3–4(–5) mm, dorsal ribs rounded or acute.
    2. Mature fruits tan; ribs usually corky-thickened, not thin and wing-like; North America ..... 2. **Ammoselinum popei**
    2. Mature fruits blackish; ribs thin, wing-like; South America ..... 3. **Ammoselinum rosengurtii**

1. **Ammoselinum butleri** (Engelm. ex S. Wats.) Coulter & Rose, Bot. Gaz. 12: 294. 1887. *Apium butleri* Engelm. ex S. Wats., Proc. Amer. Acad. Arts 21: 453. 1886. **LECTOYPE** (Coulter & Rose 1900, p. 90): **USA. Texas**. Harris Co.: near Houston, 29 Mar 1872, *E. Hall 244* (GH; isolectotypes: BM digital image!, K digital image!).

    Watson cited three collections: (1) "Texas, in wet grounds near Houston, *E. Hall* (n. 244), March, 1872"; (2) "near Dallas, *J. Reverchon*[*s.n.*], March and April 1874"; and (3) "Indian territory, south of the Arkansas, *G.D. Butler* [*s.n.*], 1876." Coulter and Rose (1900) noted that "The type here given is the first specimen cited" but they clearly referred to it as the type and to the Reverchon and Butler collections as "associated with it in the original description."

Stems 4–10 cm, branching from the base. **Leaves**: blades oblong to oblong-ovate in outline, 10–25 mm, ultimate divisions 1–8 mm; leaflet and bractlet margins and midrib smooth to very sparsely scaberulous; petioles 5–30 mm, clasping to auriculate-clasping, scarious-margined at the base. **Inflorescence** axillary, indeterminate. **Peduncles** absent (rays appearing to emerge from the leaf axils). **Rays** (1–)2–4, (0–)0.5–4(–7, very rarely to 15) mm. **Umbellets** (1–)3–5-flowered (central umbellet often 1-flowered); pedicels (0.5–)1–3(–4) mm (central flower sessile). **Involucel bractlets** 1–4, linear, rarely 2-fid, 0.5–2 mm, without scarious margins. **Schizocarps** ovoid-oblong, 2–2.2 mm, dorsal ribs acute, sparsely papillate-scaberulous with minute, translucent, apparently 1-celled, conical, apically acute, papilla-like hairs, lateral ribs slightly corky-thickened, barely raised; oil tubes 1 per interval, filiform but usually clearly evident, 2 on the commissure; carpophore bifid in distal 1/4. **Chromosome number** not reported.

Flowering Mar–Apr. Sandy and sandy clay soil, gravel piles, lawns, old fields, roadsides, cultivated fields, pastures, fencerows, stream and pond edges, shell banks, oak-juniper glades, limestone prairies; 100–300 m; Ala., Ark., Kans., La., Miss., Mo., N.C., Okla., Tenn., Tex.

Almost all habitats recorded for *Ammoselinum butleri* have been described in some sense as "disturbed" — some of those in Texas (glades and prairies) apparently are undisturbed. The species has only recently expanded into Alabama, Mississippi, and North Carolina (Boufford 1977; Bryson 1991; Keener 2007).

2. **Ammoselinum popei** Torrey & A. Gray, Pacif. Railr. Rep. 2(4): 165. 1855 [1857]. *Apium popei* (Torrey & A. Gray) A. Gray, Proc. Amer. Acad. Arts 7: 343. 1868. **LECTOYPE** (designated here): **USA. Texas**. Headwaters of the Colorado, 13 Apr 1854, *J. Pope s.n.* (NY digital image!). At GH is another Pope specimen, labeled "Mar-Apr, Llano Estacado;" this may be a duplicate of the NY sheet, but it is not clear.

> The protologue has this: "Sandy soil; Llano Estacado, and head-waters of the Colorado [collections by 'Captain Pope']; March and April. Mr. Wright found it in Western Texas, but he collected only a few specimens, and it was not distributed with his plants. Some ripe seeds that he collected were cultivated in the Cambridge Botanic Garden, and arrived at perfection. Dr. Parry, while engaged on the Mexican boundary survey, under Major Emery, sent home a single flowering specimen of the plant, found at Eagle Pass in January, 1853. From no other sources have we received any specimens of this apparently new genus."

Stems 8–35(–60) cm, branching from the base. **Leaves**: blades oblong-ovate in outline, 10-40 mm, ultimate divisions 2–10 mm; leaflet and bractlet margins and midrib prominently scabrous. petioles 5–60 mm, clasping to auriculate-clasping, scarious-margined at the base. **Inflorescence** axillary, indeterminate. **Peduncles** 25–75 mm. **Rays** (5–)6–10, (0–)6–25 mm (inner umbellet sessile). **Umbellets** 4–9 flowered; pedicels (0–)2–5 mm (inner flower sessile to subsessile). **Involucel bractlets** 1–6, linear and entire or less commonly 2–3-fid, 2–12 mm, usually scarious-margined at the base. **Schizocarps** urceolate-oblong, 3–4(–5) mm, dorsal ribs rounded, densely and coarsely papillate-scaberulous with translucent, multicelled, convex, apically rounded, papilla-like hairs, lateral ribs corky-thickened and raised and obscuring the commissural face; oil tubes 1 per interval, barely evident between the thickened ribs, commissural usually not evident; carpophore bifid along whole length. **Chromosome number** not reported.

Flowering (Mar–)Apr–May. Sandy soil, rocky soil, rock outcrops, roadsides, pastures, lake edges, dunes, gypsum flats, limestone barrens, cedar glades, mesquite savannas, gypsiferous, calcareous, and black clay prairies; 0–800(–1300) m; Kans., N.Mex., Okla., Tenn., Tex.; Mexico (Coahuila, Nuevo León, Tamaulipas).

The disjunct populations in central Tennessee (5 counties, see TENN 2012) are typical in morphology and apparently native there.

An epetiolate leaf rarely is produced at the base of a cluster of rays. This is a consistent feature in the plants of *Tolstead 7015* (SMU) from Taylor Co., Texas.

Collections examined. **USA. New Mexico**. Eddy Co.: Carlsbad Cavern Natl. Park, road to sewage lagoon just across E boundary of park, SW of Whites City, bajada below escarpment, xeric shrubland, *Larrea-Gutierrezia* community, ca. 3640 ft, 19 Apr 1977, *Burgess 4449* (TEX); Carlsbad City Lake and park on the Pecos River, wet sandy loam, 20 Apr 1966, *Crutchfield 1336* (LL); Lincoln Natl. Forest, Sitting Bull Falls, growing in lawn at picnic site near trail to falls, 4595 ft, 21 Apr 2011, *Heil 33359A* (SJC). Lea Co.: City of Hobbs, jct of US 62-180 and the hwy to Lovington, lawn of convenience store, 3670 ft, 23 May 2011, *Heil & O'Kane 33424* (SJC); Hobbs, near Humble City,

entrance to Ocotillo Golf Course, weedy sites, disturbed sites, 3700 ft, 20 Apr 2011, *Heil 33347* (SJC). Otero Co.: Escarpment and canyon in limestone plateau ca. 11 air mi NE of Dell City, 3.3 road mi N and then NE from the TX/NM state line and E from hwy up canyon for 0.75 mi, on alluvium below limestone slopes, 3706 ft, roadside plants, 2 May 1999, *Worthington 28247* (UCR, fide SEINET).

Collections examined. **MEXICO**. **Coahuila**. Musquiz, 12 Apr 1936, *Marsh 2097* (TEX); Musquiz, Apr 1938, *Marsh 1132* (TEX); 56 mi S of Eagle Pass, Texas, rocky slope, 3 April 1969, *Pinkava 15576* (ASU digital image!); Rio Grande valley, near Diaz, 700 ft, 15 Apr 1900, *Pringle 8314* (MO digital image!). **Nuevo León**. 2 mi N of Sabinas Hidalgo, sandy loam bottom, 26 Mar 1944, *Barkley 14521B* (TEX); 23 mi N of Sabinas Hidalgo, limy clay hillside, 26 Mar 1944, *Barkley 14592* (TEX); 5 km N of Sabinas Hidalgo on Hwy 85, dry but verdant wash leading from apparently irrigated field, surrounding vegetation of *Acacia-Prosopis*, 310 m, 23 Mar 1986, *Nesom 5350* (TEX); Mpio. Higueras, Cuesta Mamulique, ca. 40 km S of Sabinas Hidalgo on Mex 85, W side of "Libre" Hwy, near top of ridge of dirt road toward microwave tower, area of *Acacia* and other genera of shrubs, ca. 540 m, 26 Mar 1993, *Nesom 7553* (TEX); fields near Monterrey, 1800 ft, 6 Apr 1906, *Pringle 13747* (LL, TEX). **Tamaulipas**. 10 mi S of Nuevo Laredo, dry flat, 26 Feb 1944, *Barkley 14322* (TEX); 3 mi SW of El Canelo at lat. 25° 09' on the Matamoros-Victoria hwy, clay roadside ditch, 50 ft, 9 Feb 1960, *Johnston 5077C* (TEX).

3. **Ammoselinum rosengurtii** Mathias & Constance, Bull. Torrey Bot. Club 77: 133, fig. 1. 1950. **TYPE: URUGUAY**. Depto. Florida, Estancia Rincon de Santa Elena, Picada Castro, Arroyo Mansavillagra, 8 Nov 1946, B. *Rosengurtt Gallinal 5753* (holotype: UC! digital image!; isotype: LA).

Stems ca. 4–8(–10) cm tall, simple or few-branched mostly at 1 or 2 nodes above the base; "from a *Daucus*-scented taproot" (Rosengurtt in 1969) **Leaves**: blades broadly ovate in outline, 25–40 mm, ultimate divisions 4–8 mm, scaberulous on margins and nerves; petioles 7–10 mm, scarious-margined along whole length. **Peduncles** 20–50 mm. **Rays** 2–5, 1–20 mm (inner 1–2 umbellets short-pedicellate). **Umbellets** (1–)3–5-flowered, pedicels 2–7(–10) mm (central flower short-pedicellate). **Involucel bractlets** 3–4, linear-lanceolate, entire, 1.5–7 mm, unequal, without scarious margins. **Schizocarps** ellipsoid, attenuate toward the apex, 3.2–5.3 mm, densely scabrous on the angles with thick, sharp-pointed, pustulate-based hairs, dorsal ribs 3, rounded, lateral ribs; oil tubes 3 per interval, 2 on the commissural face; carpophore bifid along whole length. $2n = 44$ (from *Rosengurtt s.n.*, 1969, see citation below; Constance et al. 1976). Figures 4, 5.

Flowering Oct–Dec. Habitat?; ca. 100–200 m; South America (Uruguay).

Additional collection examined. **Uruguay**. Depto. Rocha, Sta. Teresa, Dec 1969, *Rosengurtt s.n.* (TEX), chromosome voucher cultivated in Univ. of California Botanical Garden C-1721. Also see photos on Flickr (González 2010).

Ammoselinum rosengurtii apparently is known only from Uruguay (Mathias & Constance 1950); the protologue cited collections from provs. Artigas, Cerro Largo, Florida, Paysandú, Río Negro, Salto, and Soriana. Photos by Andrés González were taken "al margen del Río Negro cerca al dique de la Represa Constitución, departamento de Río Negro."

Ammoselinum rosengurtii is similar to *A. popei* especially in its papillate-scabrous vestiture, urceolate-oblong fruits with expanded lateral ribs, and carpophore divided along the whole length. It differs from *A. popei* in its dark fruits, thin-winged fruit ribs, and three oil tubes per dorsal interval.

SPERMOLEPIS Raf., Neogenyton, 2. 1825. **TYPE**: *Spermolepis divaricata* (Walt.) Raf. ex Seringe
In the protologue, Rafinesque noted "Type, a plant put in four genera already! Sison pusillum, Mx. Daucus divaricatus, Walt. Ammi do [divaricatum] Pers and Ligusticum pusillum Pers!" The nomenclatural combination in *Spermolepis* for *Daucus divaricatus* Walt. was made by Seringe in 1830, attributed by him to Rafinesque.

Leptocaulis Nutt. ex DC., Coll. Mém. 39, plate 10. 1829. **LECTOTYPE** (designated here): *Leptocaulis divaricatus* (Walt.) DC. De Candolle's discussion included, in various permutations, *Spermolepis divaricata*, *S. inermis*, *S. echinata*, and various synonyms.

Babiron Raf., New Fl. 4: 23. 1838. **TYPE**: *Babiron divaricatum* (Walt.) Raf. ≡ *Spermolepis divaricata* Rafinesque included *Babiron pusillum*, *B. divaricatum*, and *B. dichotomum* — all are synonyms of *Spermolepis divaricata*.

Lepisperma Raf., Act. Soc. Linn. Bordeaux 6: 268. 1834. As synonym of *Spermolepis* fide Mathias and Constance 1945).

Ammoselinum sect. *Hesperoselinum* Munz & Johnston, Bull. Torrey Bot. Club 52: 224. 1925. **LECTOTYPE** (designated here): *Ammoselinum giganteum* Coulter & Rose
After identifying their new species *Ammoselinum occidentale* Munz & Johnston as congeneric with *A. giganteum*, the authors placed the two species together in a separate section. No type was designated.

Annual herbs, slender taprooted, glabrous, not aromatic or sometimes (*S. lateriflora*) with a "carrot" odor. **Stems** erect, 5–80 cm, simple or few-branched from basal to medial nodes. **Leaves** all alternate; basal and cauline or mostly cauline, 3-pinnately compound; blades ovate to oblong to oblong-ovate in outline; leaflets filiform to linear or narrowly oblong, margins entire to weakly scaberulous; proximal petioles scarious margined at base, distal petioles becoming much foreshortened and scarious-margined along whole length. **Umbels** compound, irregularly and loosely convex, terminal and axillary or axillary only, pedunculate (rays borne on an ebracteate portion of stem) or sessile (rays appearing to arise from leaf axils), peripheral flowers not different; involucre bracts absent or (*S. hawaiiensis*) sometimes present; involucel bractlets distinct, filiform or linear to linear-lanceolate, herbaceous, without scarious margins. **Pedicels** present or reduced to obsolete. **Flowers** bisexual; sepals obsolete or essentially absent; petals white, oblong or elliptic to ovate, apex not inflexed, margins entire; stylopodium conical; styles obsolete, stigmas directly atop stylopodium and divergent. **Schizocarps** broadly ovoid to ellipsoid or elliptic-ovoid, sometimes slightly beaked, 1.5–2(–4) mm, flattened laterally and slightly constricted at the commissure, mericarps splitting, ribs [number], filiform, oil tubes 1(–3) per interval, 2 on the commissure, surface (a) echinate-bristly with apically hooked hairs arising from rounded, multicellular bases, (b) bristly with apically straight hairs arising from rounded, multicellular bases, (c) tuberculate-roughened by rounded, multicellular projections, (tuberculae and multicellular hair bases apparently homologous), or (d) scabrous with minute, upcurved hairs not arising from a tuberculate base; commissural face sulcate; carpophore bifid in distal 1/4–1/3. **Base chromosome number** = 11? (n = 8, 10, 11, 19, 32).

KEY TO THE SPECIES

1. Schizocarps densely echinate-bristly with sharp-pointed, apically hooked hairs.
   2. Distal umbels sessile, without a peduncle, proximal umbels sometimes pedunculate; $2n = 16$ ..... 1. **Spermolepis lateriflora**
   2. All umbels distinctly pedunculate.
      3. Schizocarps 1.5–2 mm; $2n = 20$ ..... 2. **Spermolepis echinata**
      3. Schizocarps 3–4 mm; $2n = 22$ ..... 3. **Spermolepis hawaiiensis**
1. Schizocarps with apically straight hairs or lacking hairs.

4. Distal umbels sessile, without a peduncle, proximal umbels sometimes pedunculate; fruit surface tuberculate on ribs and intervals, some tubercles with apically straight hairs, some without hairs ..... 4. **Spermolepis infernensis**
4. All or most umbels distinctly pedunculate; fruit surfaces variable in vestiture.

5. Schizocarps 3–5 mm, narrowly elliptic-ovate to oblong-ellipsoid or ovoid-oblong, surface hispid-hirsutulous.

6. Hairs blunt-tipped, arising from a tuberculate base; South America ..... 10. **Spermolepis castellanosii**
6. Hairs sharp-pointed, arising from a non-tuberculate base; North America ..... 11. **Spermolepis gigantea**

5. Schizocarps 1.2–2 mm, mostly broadly ovate to broadly ellptic, surface either completely smooth, tuberculate but hairless, tuberculate with a few hairs, or sparsely to densely scabrous with minute, upcurved or upturned hairs.

7. Fruit surface ribbed but otherwise completely smooth, lacking even tubercles ..... 6. **Spermolepis laevis**
7. Fruit surface either tuberculate (with or without straight, erect hairs) or with minute, upcurved or upturned hairs.

8. Fruit surface tuberculate with multicellular trichome bases, but totally lacking hairs

9. Tubercles irregularly scattered, some with short, erect hairs; peduncles 0.9–3.5 cm ..... 7. **Spermolepis organensis**
9. Tubercles densely arranged, without hairs; peduncles 2–7 cm ..... 5. **Spermolepis inermis**

8. Schizocarps sparsely to densely scabrous with minute, 1-celled, upcurved or upturned hairs, the hairs not arising from multicellular tubercles.

10. Pedicels (0–)2–9 mm; rays 5–17 mm; central 1–2 flowers of each umbellet sessile to subsessile ..... 8. **Spermolepis divaricata**
10. Pedicels (8–)14–32 mm; rays 15–33 mm; all flowers of each umbellet with subequal pedicels, none sessile or subsessile .....9. **Spermolepis diffusa**

1. **Spermolepis lateriflora** G.L. Nesom, **sp. nov.** **TYPE: USA. Arizona.** Pima Co.: Rillito Valley, Tucson, 29 Apr 1905, *J.J. Thornber 5241* (holotype: TEX!; isotypes: ARIZ!, RSA!, UC!).

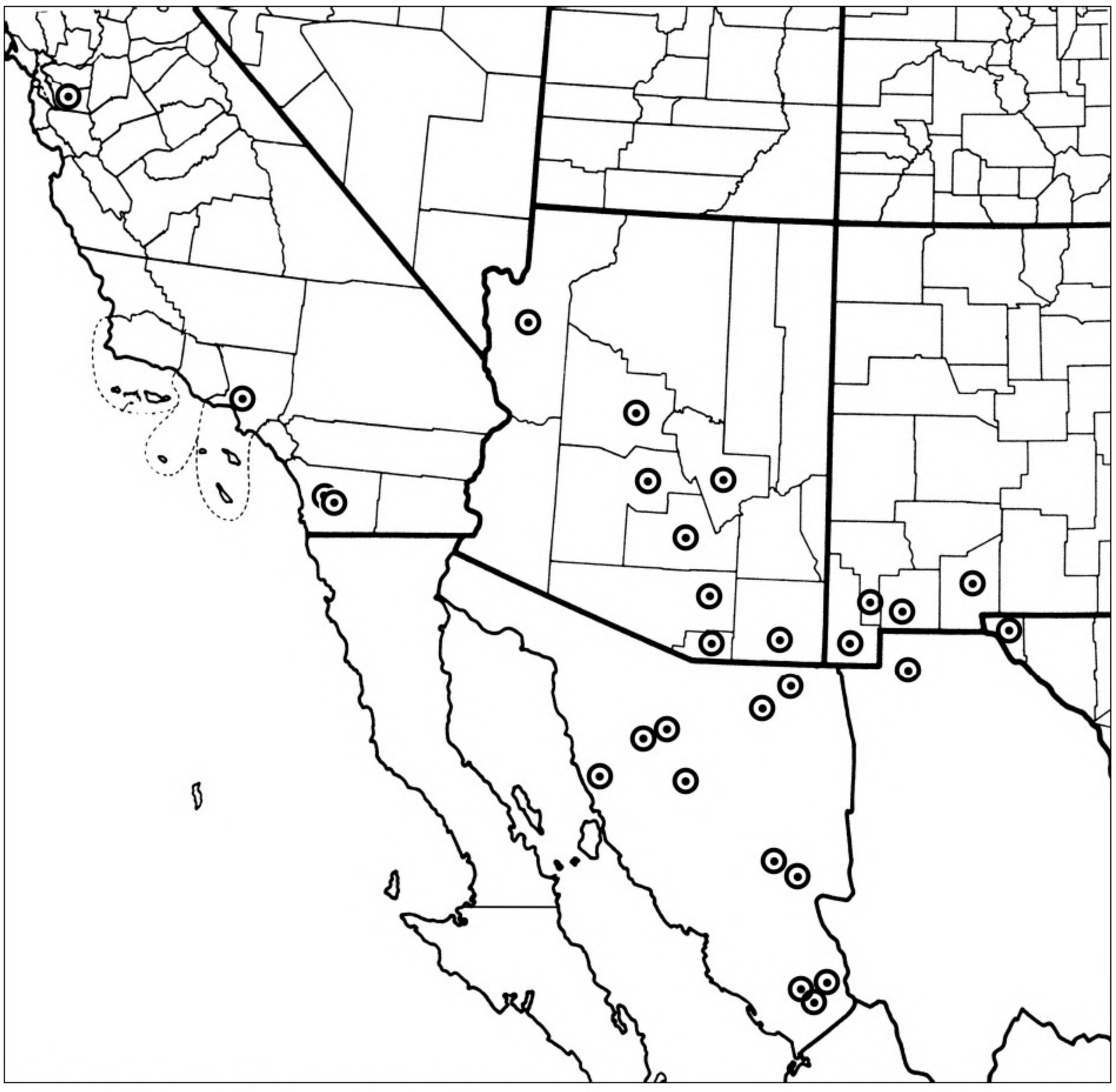
Similar to *Spermolepis echinata* (and previously identified as that species) in its fruits densely echinate-bristly with uncinate hairs but distinct in its epedunculate (sessile) umbels.

Stems 5–35 cm. **Leaves**: blades broadly ovate in outline, mostly 1–5 cm, finely ternately dissected, ultimate segments linear to oblong, 4–12 mm; petioles 1–3 cm. **Peduncles** absent or 20–70 mm. **Umbels usually** axillary only, usually sessile at all nodes, alway sessile at distal nodes, occasionally pedunculate below the distalmost; involucre bracts absent; involucel bractlets 2–4, linear, 1–2 mm; fruiting rays 4–5 per node, (0–)1–14 mm (central 1–2 umbellets sessile to subsessile), unequal, spreading; umbellets 3–8-flowered; fruiting pedicels 1–6 mm (central 1–2 flowers subsessile). **Schizocarps** 2–2.2 mm, densely echinate-bristly with apically hooked hairs; oil tubes 1

per dorsal interval. $2n = 16$ (reported as *Spermolepis echinata*; Constance et al. 1976; Pima Co., Arizona, *Gentry 19933*, ARIZ!, RSA!, UC-2 sheets!). Map 2. Figures 6, 7.

Flowering Mar–Jun. Sandy, gravelly, and rocky soil, alluvium, river beds, floodplains, riparian vegetation, desert grassland, desert shrub, creosote bush flats, saltbush flats, cholla forest, mesquite scrub and woodland, oak-mesquite, oak savanna, oak-juniper woodland; (300–)700–2000 m; Ariz., Calif. (probably adventive), N.Mex., Tex.; Mexico (Chihuahua, Sonora).

Some plants produce pedunculate umbels from nodes below the distal-most; e.g., **Arizona**. Pima Co. (*Gentry 19933*, UC; *Harrison et al. 8600*, ARIZ; *Shreve 10092*, UC); Maricopa Co. (*Peebles 8475*, UC). **New Mexico**. Dona Ana Co. (*Jones 26257*, POM-2 sheets). **Sonora**: Mpio. Soyopa, *Reina G. 2005-56*, TEX).



Map 2. Distribution of *Spermolepis lateriflora*.

Additional collections examined. **USA. California**. [Alameda Co.:] Oakland Hills, May 1877, [*J.G. Lemmon*?] *s.n.* (UC!). Los Angeles Co.: Verdugo Mountains, Tuna Canyon, shady moist banks, 1100 ft, Apr 1930, *MacFadden 2441* (MACF digital image!). San Diego Co.: due S of

Borrego Valley, rocky terrain on alluvial slopes, 1250 ft, 30 Mar 1952, *Bacigalupi & Macbride 3570-A* (UC!); lower Box Canyon, 29 Apr 1941, *Gander 9194* (SD fide Calif. Consortium); near base of hills S of Vallecito Stage Sta., 30 Apr 1941, *Gander 9260* (SD digital image!). Other map points are from specimens studied from ARIZ, BRIT-SMU-VDB, NMC, SRSC, TEX-LL, and UC-JEPS.

Munz and Keck (1959) identified the California plants as *Ammoselinum giganteum* (with *A. occidentale* in synonymy) but, following their identification/annotation as *Spermolepis echinata* in 1948 by Constance, they have been identified as *S. echinata* in iterations of the Jepson Manual (Constance 1993; Constance & Wetherwax 2012).

All of the California collections of *Spermolepis lateriflora* are separated from the main range of the species and all were made near urban areas (Oakland, Los Angeles, San Diego). These occurrences perhaps resulted from inadvertent recent dispersal of the echinate-bristly fruits from Arizona. CalFlora (2012) shows a number of other records (identified as *S. echinata*, apparently not vouchered) from the southwest region of the Anza-Borrego Desert State Wilderness Park (about 50-60 miles east of San Diego) and these may be other occurrences of S. *lateriflora*. The Vallecito Stage Station (*Gander 9260*) is on the southern border of the Anza-Borrego park. The type locality of *S. infernensis* (Hellhole Canyon Preserve, as described below), however, is in the close vicinity and the identity of these unvouchered records needs to be verified.

Additional collections examined. **USA. Texas**. El Paso Co.: E slope of Franklin Mt., N of El Paso, off War Road, bajada, 1 May 1970, *Correll 38548* (LL); Franklin Mts. on trail to Cottonwood Springs, E of Canutillo, on bajada, 12 May 1959, *Correll & Johnston 21824* (LL); 0.5 mi W of intersection of Hwy 54 and transmontane hwy, along roadside, red sandy soils, 1 Apr 1998, *Turner 98-29* (TEX); ca. 20 mi E of El Paso, 4000 ft, 5 Apr 1958, *Warnock & Johnston 16215* (SRSC); E slopes of Franklin Mountains, gravelly granitic soil, 20 Apr 1975, *Warnock 23985* (SRSC); Franklin Mts., below (E) Fusselman Canyon flood control dam, 4450 ft, mixed alluvium, 1 Apr 1979, *Worthington 4219* (TEX); Hueco Mts., Hueco Tanks State Park, N end of North Mountain in small canyon, 29 Apr 1979, *Worthington 4407* (BRIT); Franklin Mts., E side of mts., 0.2 mi N jct Trans-Mountain Rd and War Rd, granite soil alluvial bajada, desert shrub, 4000 ft, 9 Apr 1982, *Worthington 8071* (BRIT).

Representative collections examined (see SEINET 2012 for many others from Arizona and New Mexico). **USA. Arizona**. Cochise Co.: 19 mi NE of Douglas, desert grassland, 4000 ft, 17 Apr 1940, *Benson 10298* (ARIZ); Mule Mts., waste spots, S-facing slopes, 25 Apr 1952, *Goodding 47-52* (ARIZ). Gila Co.: Tonto National Monument, along power line, 26 Jul 2001, 740 meters, *West 1099* (ARIZ). Graham Co.: Tanque, 1200 m, 8 May 1924, *Eggleston 19889* (ARIZ). Maricopa Co.: Sand Tank Mts., 48 km SE of Gila Bend, small drainage, Sonoran desert scrub, 30 Apr 2003, *Baker 15323* (ARIZ); Sonoran Desert Natl. Monument, Sand Tank Mts., summit of small peak 730 m NW of Bender Spring, 17 Apr 2001, *Felger 01-362* (ARIZ). Mohave Co.: 7 mi S of Yucca, along sandy wash in Joshua tree-creosote bush area, 2300 ft, 12 Apr 1947, *Gould & Darrow 4318* (ARIZ); Yucca, 14 May 1884, *Jones s.n.* (POM). Pima Co.: Fresnal Canyon, 23 Apr 1932, *Harrison et al. 8600* (ARIZ); Santa Catalina Mts., Lower Sabino Canyon, moist sand along stream, 2800 ft, 8 Apr 1946, *Gould 3488* (ARIZ); Coronado Natl. Forest, S on State Hwy 83, ca. 13 mi from Interstate 10, open pastures, 1400 m, 19 Apr 1998, *Schmidt & Merello 2670* (BRIT, RSA, DNA sample). Pinal Co.: Gila River bottom near Sacaton, 23 Feb 1926, *Porter et al. 863* (ARIZ); Oracle, 12 May 1905, *Thornber s.n.* (ARIZ). Santa Cruz Co.: Nature Conservancy Patagonia-Sonoita Creek Sanctuary, SW of Patagonia, ca. 4000 ft, 30 Apr 1977, *Fay 241* (ARIZ); 2 mi E of Nogales of Patagonia road, gravel along roadcut, 3800 ft, 9 May 1945, *Gould & Pultz 3093* (ARIZ). Yavapai Co.: Bald Hill, mouth of West Cochise Stronghold, flats of mouth of canyon, 11 Apr 1960, *Goodding 49-60* (ARIZ); Congress Junction, 3000 ft, 4 May 1903, *Jones s.n.* (POM). **New Mexico**. Dona Ana Co.: White Sands Missile

Range, Gate 4, up road ca. 1 mi "Anemone Ridge," ca. 2 mi N of US 70, just E of San Augustin Pass, Chihuahuan Desert Scrub community, monzanite boulders, 4500 ft, 22 Mar 2010, *Heil & Anderson 32092* (SJC); W base of Organ Mtns, at the mouth of Dripping Springs Canyon, 11 mi E of northern Las Cruces, about 1/4 mi W of the ruins of an abandoned resort hotel [Van Patten's], plants very common in a flat, unshaded area at the mouth of a rocky arroyo, 6000 ft, with *Erigeron nudiflorus*, *Cercocarpus*, *Fallugia*, *Celtis* and *Opuntia*, 25 April 1982, *Ward & Soreng 82-009* (NMC); in the Mesilla Valley; near Las Cruces, ca. 3850 ft, 8 April 1907, *Wooton & Standley s.n.* (NMC). Grant Co.: 1 mi S of Gila, gravelly mesa slope, 21 May 1935, *Maguire et al. 11530* (ARIZ); 1 mi S of Red Rock, gravelly mesa top, assoc. *Prosopis* and *Opuntia*, 21 May 1935, *Maguire et al. 11530* (UC). Hidalgo Co.: State Hwy 92 to Virden, ca. 2.5 mi N of US 70, roadside alluvial soils, desert grassland with scattered creosote, 4085 ft, 20 Mar 2010, *Heil 32041* (SJC); BLM, Gila Lower Box fishing area, along Gila River and rocky hills above river, riparian community and desert grassland, 4000 ft, 28 Apr 2010, *Heil & McClain 32322* (SJC); San Simon Valley between Rodeo and Arizona-New Mexico line, fine textured soils of the valley bottom in desert grasslands, 4100 ft, with *Hilaria mutica*, *Scleropogon brevifolius*, *Bouteloua eriopoda*, *Ephedra trifurca*, *Prosopis*, *Gutierrezia sarothrae*, 10 April 1978, *Moir 101* (NMC). Luna Co.: ca. 11 mi NW of Florida Station, among rocks in bed of dry creek, 29 Apr 1947, *McVaugh 8128* (SMU, TEX).

Collections examined. **MEXICO. Chihuahua**. Extreme NW corner [of the state], about 50 m E and 1.5 mi. S of U.S. border, in silty, heavily overgrazed bottom of draw, with *Yucca elata*, *Sporobolus airoides*, *Astragalus wootonii*, 13 May 1980, *Spellenberg & Ward 5525* (NMC). **Sonora**. 6.7 mi by road (Mexico 15) N of Magdalena, rocky hills, desert shrubs, 7 Apr 1968, *Felger 17451* (ARIZ); vicinity of Cerro Pelon, ca. 5 mi SE of Desemboque, 21 Apr 1968, *Felger 17894* (ARIZ); near El Guayabo on road 18 km E of Alamos. 27° 0' 20" N, 108° 47' 10" W, 250 m, 16 Mar 1989, *Ferguson s.n.* (ARIZ); along Hwy 89, 9.2 mi S of Arroyo Los Ajos, 7.4 mi N of Mututucachi, roadside in oak savanna, 212 Apr 1995, *Fishbein 2242* (ARIZ); Rio Mayo, San Bernardo, arroyo, Lower Sonoran, margin of a wash, 22 Feb 1935, *Gentry 1339* (ARIZ); Carbó, 50 km N of Hermosillo, wash near Mex Hwy 15, 6 Apr 1975, *Helmkamp s.n.* (UCR); Rancho El Aguilar Noria, N of Ures and Santiago, 29° 33' N, 110° 25-26' W, open, broad drainage, Sonoran desert scrub, on mesic N slopes, ca. 500 m, common, 21 Apr 1991, *Joyal 1995* (TEX); Dto. de Altar, Picu Pass, 23 Mar 1926, *Long 7a* (ARIZ); 18.7 mi W of Rte 19, along turnoff 3.2 mi N of Esqueda, oak grassland, mesquite bottomlands, 27 Mar 1970, *McGill 64048* (ASU); 4.6 mi S of Cucurpe, cliff-face along San Miguel River and road, 29 Mar 1970, *McGill & Pinkava 6519* (ASU); Near El Guayabo on road 18 km E of Alamos, 250 m, 16 Mar 1989, *Martin & Ferguson s.n.* (ARIZ); Mpio. Soyopa, E side of Mex 16, 1 km S of Río Yaqui Bridge, 28° 31' 30 " N 109° 32' W, 180 m, 14 Mar 1988, *Martin, Ferguson, & Moore s.n.* (NMC); NE side of Rio Yaqui bridge on Mex 16, just S of Tonichi, 200 m, in sand, 18 Feb 1997, *Reina G. 97-44* (ARIZ); Arroyo La Quema, near Tepoca, tropical decid. forest on slopes, rocky stream canyon, 560 m, 21 Mar 1998, *Reina G. 98-378* (ARIZ); Mpio. Benjamin Hill, 3.5 km SW of Benjamin Hill on road to Palo Alto, Sonoran desert scrub, 2408 ft, locally very common annual on disturbed rocky soil, 1 Jan 2003, *Reina G. 2003-286-A* (ASU); 0.8 km N of Mex 16 on road to San Antonio de la Huerta, 28° 34' 16" N, 109° 34' 52" W, very open thornscrub, 299 m, locally uncommon on flats, 15 Mar 2005, *Reina G. 2005-256* (TEX); Agua Prieta, Hwy 2, ca. 26 mi E of Agua Prieta and 24 mi W of the state line at Puerto San Luis, desert scrub of *Juniperus*, *Acacia*, *Prosopis*, *Yucca baccata*, *Gutierrezia*, etc. on rocky volcanic hills, 1300 meters, 19 Mar 1984, *Sanders 4712* (UCR); Alamos, Rio Mayo Region, Rancho La Huerta, ca. 2 mi NW of Alamos on the road to San Bernardo, north of the Alamos airstrip, weedy disturbed areas near buildings and roads, 420 meters, 15 Mar 1993, *Sanders 13152* (UCR); Alamos, Rio Mayo region, roadside c. 12 km W of Alamos on the road to Navojoa, in vicinity of Cañon Agua Marina, at the foot of the Sierra de Alamos, burned roadside in hilly country 1640 ft, 15 Mar 1993, *Sanders 13180* (UCR); Alamos, Parque Chalaton and along canyon bottom above, SW edge of Alamos in foothills of the Sierra de Alamos, tropical deciduous forest and cleared areas, 420-450 meters, 17 Mar 1993, *Sanders 13365*

(UCR); Dist. Alamos, near Cerros, 4 Mar 1933, *Shreve 6167b* (ARIZ); 8 mi S of Estacion Llano, 3 Apr 1935, *Shreve 7323* (ARIZ); Palm Canyon, 17 mi SE of Magdalena, in Sierra Babiso, (= Cerro Cinta de Plata), stream bed,13 Feb 1977, *Van Devender s.n.* (ARIZ); 4 mi of El Ocuca on Mex 2, 21.4 mi E of Altar, annual in wash, 10 Mar 1977, *Van Devender s.n.* (ARIZ); 17 mi SE of Magdalena on road to Cucurpe, Palm Canyon, Cerro Cinta de Plata, 15 May 1979, *Van Devender et al. s.n.* (ARIZ); Alamos, Rio Mayo region; Arroyo Mentidero at the crossing of El Chinal Road, near Rio Cuchujaqui, 11.5 km (by air) S of Alamos, tropical deciduous forest, 240 meters, 10 Mar 1993, *Van Devender 93-97* (ARIZ, UCR); Alamos, Rio Mayo region; La Huerta, 1.8 km NNE of Alamos on San Bernardo Road, 410 meters, 9 Mar 1993, *Van Devender 93-216* (ARIZ, UCR); La Huerta, 1.8 km NNE of Alamos on San Bernardo Road, common annual in yard, 410 meters, 9 Mar 1993, *Van Devender 93-216* (ASU); 0.4 mi E of Punto Cirio, Sierra Bacha, Sonoran Desert desert scrub, 40 m, 24 Mar 1995, *Van Devender 95-210* (ARIZ, UCR); El Llano de Curea, foothills thornscrub, locally uncommon annual, 514 meters, 19 Mar 2004, *Van Devender 2004-161* (ASU); 2.2 km SE of Rancho Las Borregas headquarters on road to Nogales, SE tributary of Arroyo Planchas de Plata, sycamore-oak canyon, 1187 m, 22 Apr 2004, *Van Devender 2004-250A* (ARIZ); 7.9 mi N of Esqueda, 11 May 1948, *Wiggins 11777* (TEX).

2. Spermolepis echinata (Nutt. ex DC.) A. Heller, Contr. Herb. Frankl. & Marsh. Coll. 1: 73. 1895. *Leptocaulis echinata* Nutt. ex DC., Prodr. 4: 107. 1830. *Apium echinatum* (Nutt. ex DC.) Benth. & J.D. Hook. ex S. Wats., Bibl. Index N. Amer. Bot., 412. 1878. **TYPE: USA. Arkansas**. "In Amer. bor. ad Red River" [protologue], *T. Nuttall s.n.* (holotype: BM digital image!; isotype: PH digital image!).

De Candolle noted ("v.s.") that he had seen the Nuttall collection.

Stems 5–40 cm. **Leaves**: blades broadly ovate in outline, 0.7–2.5 cm, 3-pinnately compound, ultimate divisions filiform, 2–18 mm x 0.5–1 mm; petioles 3–20 mm. **Peduncles** (1–)2–5(–6.5) cm. **Umbels** axillary mostly at distal nodes, all pedunculate; involucel bractlets 1–3(–4), linear, 1–3 mm, margins scabrous-toothed; fruiting rays 5–9(–12), (0)1–15 mm (central umbellet sessile to subsessile), unequal, suberect and evidently clustered; umbellets (1–)3–9-flowered; fruiting pedicels 1–6(–7) mm (central flowers short-pedicellate). **Schizocarps** 1.5–2 mm, densely echinate-bristly. $2n = 20$ (Constance et al. 1976; Prairie Co., Arkansas, *Demaree 61921*, duplicate SMU!). Figure 8.

Flowering (Mar–)Apr–May(–Jun). Sand, gravel, silt, sandy clay, sandy roadsides and flats, disturbed areas, ditches, disturbed sites, pastures, rocky slopes, shell banks, sandstone outcrops, beaches, creek bottoms, lake shores, prairies, post oak woods, live oak woods, oak-mesquite woodland, desert shrub; (0–)100–300(–1500) m; Ala., Ark., Fla., Ga., Ill., Iowa, Kans., Ky., La., Miss., Mo., N.Y., N.C., Okla., S.C., Tenn., Tex., Va.; Mexico (Coahuila, Tamaulipas).

Specimen examined. **MEXICO. Coahuila**. Piedras Negras, *Pringle 8309* (fide Villarreal 2001, voucher not seen in present study). **Tamaulipas**. 20 mi W of Reynosa, desert scrub in clayish soil, 28 Feb 1944, *Painter & Barkley 14378* (TEX).

Attributions of *Spermolepis echinata* to Arizona, California, and New Mexico have been based on collections identified here as *S. lateriflora*. In Texas, typical *S. echinata* reaches as far west as Brewster, Culberson, Jeff Davis, Pecos, and Presidio counties, but it does not extend to El Paso Co. at the easternmost extension of the distribution of *S. lateriflora*. No confirmed records of *S. echinata* exist from New Mexico.

A plant collected in north-central Texas has the habit and inflorescence of *Spermolepis echinata* and echinata-like fruits (densely tuberculate-hairy) but with the hairs relatively short and without an uncinate apex. Wilbarger Co.: 14.5 mi W of Electra, Waggoner pastures, turn W 0.6 mi S on Hwy 85, tall grass in draw, mesquite savanna, sandy loam, 12 May 1945, *Whitehouse 9828* (SMU).

3. **Spermolepis hawaiiensis** H. Wolff, Repert. Spec. Nov. Regni Veg. 17: 440. 1921. **TYPE: USA. Hawaii**. Kauai, Weimea, [no date], *Hillebrand s.n.* (holotype: probably B, Wolff material at B mostly extant fide HUH online database). **EPITYPE** (designated here): **USA. Hawaii.** Kauai Co. (Kauai Island): Koai`e Canyon, just below "the fingers" near the ridge and above N-facing cliffs W of Lonomea Camp and Kawai`iki and E of Hipalau, 704 meters, 21 Apr 2004, *N. Tangalin 47* (PTBG 043006, digital image on JSTOR!; Fig. 9). This collection was made near the type locality.

Stems 5–20 cm. **Leaves**: blades oblong to ovate in outline, 1–4 cm, 3-pinnately compound, becoming sessile, smaller, and less divided distally, ultimate divisions linear to linear-lanceolate, 3–6 mm; petioles 10–30 mm. **Peduncles** 1–3 cm. **Umbels** at distal nodes, axillary, all pedunculate; involucre bracts absent; involucel bractlets (0–)1–5, linear-lanceolate, 1–6 mm; fruiting rays 2–7, (0–)5–15 mm (central umbellets sessile to short-pedicellate), unequal, spreading-ascending; umbellets 2–8-flowered; fruiting pedicels (0–)2–6 mm (central flower sessile to short-pedicellate), unequal, spreading-ascending to ascending. **Schizocarps** 3–4 mm, densely echinate-bristly, hairs arising from multicellular tuberculate bases. $2n = 22$ (Wagner et al. 2005). Figure 9.

Flowering (Dec, Feb–)Mar–Apr. Steep mesic forests, gulch slopes and ridge tops in dry forest, shrub lands, steep to vertical cliffs, cliffs bases, ridges in coastal dry cliff vegetation, N-facing slopes, ridges on bare rock, open, rocky, goat-ravaged area, a'a lava; 50–700 m; endemic to the Hawaiian Islands — Hawaii, Kauai, Lanai, Maui, Molokai, Oahu. Information from NTBG (2012) and USFWS (2010).

4. **Spermolepis infernensis** G.L. Nesom, **sp. nov.** **TYPE: USA. California**. San Diego Co.: Hell Hole Canyon near Borego, 5-7 Apr 1932, *C. Epling & W. Robison s.n.* (holotype: RSA!; isotype: UC! digital image!).

Similar to *Spermolepis lateriflora* in its epedunculate (sessile) umbels but different in its sparse fruit vestiture of apically straight, blunt-tipped hairs.

Stems 7–13 cm, branching from the base. **Leaves**: blades broadly ovate in outline, mostly 1–2 cm, finely ternately dissected, ultimate divisions linear to oblong, mostly 2–6 mm; petioles 10–20 mm. **Peduncles** usually absent, occasionally present and 2–3.5 cm. **Umbels** axillary, sessile at distal nodes, sometimes pedunculate at proximal nodes; involucre bracts absent; involucel bractlets (1–)2–4, linear, 1–4 mm, margins entire, herbaceous, without scarious margins; fruiting rays 4–5 per node, (0–)3–10 mm (inner umbellets sessile or subsessile to short-pedicellate), unequal, spreading; umbellets (2–)4–7 flowered; fruiting pedicels 1–5.5 mm (inner flowers short-pedicellate). **Schizocarps** 1.5–2 mm, ribs rounded, sparsely to moderately tuberculate to hispidulous-spinulose on the angles and intervals with pustulate multicellular mounds, each pustular mound with a straight, erect, blunt-tipped, unicellular, hairlike cell, 0.1–0.2 mm or some mounds without a hair, lateral ribs not strongly differentiated; oil tubes 3 per interval, barely evident between the thickened ribs. **Chromosome number** not reported. Map 5. Figures 10, 11.

Flowering Mar–Apr. Desert shrubland; 600–700 m; California (San Diego Co.).

In deriving the concept and description of *Spermolepis infernensis*, I have seen only the two sheets of the type collection, which include 9 separate plants of consistent morphology. The type collection is from the area of the Hellhole Canyon Preserve, which is northeast of Escondido at elevations of about 1800–2000 feet elevation. The reference by Epling and Robison to "Borego" apparently meant Borrego, since Hellhole Canyon is in the general vicinity of the Borrego Valley and the Anza-Borrego Desert State Wilderness Park (see comments above in connection with *S. lateriflora*).

Spermolepis infernensis and *S. lateriflora* perhaps are sister species, in view of their similarity in inflorescence structure and distribution in the western USA. It is possible that *S. infernensis* is a recent derivative of *S. lateriflora*, with a reduction in the density of the fruit vestiture and a developmental change that results in truncation of the hairs. The difference in appearance is striking, however, and the effect on dispersal potential surely must be significant.

5. Spermolepis inermis (Nutt. ex DC.) Mathias & Constance, Bull. Torrey Bot. Club 68: 124. 1941. *Leptocaulis inermis* Nutt. ex DC., Coll. Mém. 5: 39, plate 10, fig. B. 1829. *Spermolepis patens* var. *inermis* (Nutt. ex DC.) Mathias, Brittonia 2: 243. 1936. **TYPE: USA. Arkansas.** "In Amer. bor. ad Red River" [protologue], *T. Nuttall s.n.* (holotype: BM digital image!; isotype: PH digital image!).

De Candolle noted ("v.s.") that he had seen the Nuttall collection.

Leptocaulis patens Nutt. ex DC., Prodr. 4: 107. 1830. *Apium patens* (Nutt. ex DC.) S. Wats., Bibl. Index N. Amer. Bot., 413. 1878. *Apiastrum patens* (Nutt. ex DC.) Coulter & Rose, Rev. N. Amer. Umbell., 110. 1888. *Spermolepis patens* (Nutt. ex DC.) B.L. Robins., Rhodora 10: 34. 1908. **TYPE: USA. Arkansas.** "In Amer. bor. ad Red River" [protologue], *T. Nuttall s.n.* (holotype: BM digital image!; isotypes: NY digital image!, PH digital image!).

De Candolle noted ("v.s.") that he had seen the Nuttall collection.

Stems 8–80 cm. **Leaves**: blades oblong-ovate in outline, 3–5 cm, 3-pinnately compound, ultimate divisions filiform, 3–30 mm x 0.1–1 mm; petioles 4–15 mm. **Peduncles** 2–7 cm. **Umbels** terminal and axillary, all pedunculate; involucre bracts absent; involucel bractlets 1–4, linear to linear-lanceolate, 2–5 mm, margins scabrous-toothed; fruiting rays 5–11, suberect and evidently clustered, unequal, 1–13 mm (central umbellet subsessile); umbellets 2–7-flowered; fruiting pedicels (0–)1–6 mm (central flower sessile to short-pedicellate). **Schizocarps** 1.2–2 mm, tuberculate, without trichomes; oil tubes 1 per dorsal interval. **Chromosome number** not known (reported in error as $2n = 22$ by Bell & Constance 1957; voucher from Florida identified here as *S. divaricata*). Map 3. Figure 13.

Flowering Apr–May(–Jun). Sand, river silt, gravelly soil, clay loam, sand prairies, blackland prairies, shale glades and barrens, rocky ridges, granite outcrops, limestone crevices, oak-juniper woodland, ditch banks, woods edges, roadsides, fields; 30–200(–900) m; Ala., Ark., Ill., Ind., Iowa, Kans., La., Md., Minn., Miss., Mo., Nebr., N.Mex., Okla., Tenn., Tex.; Mexico (Coahuila).

East of the Mississippi River in the southeastern USA, *Spermolepis inermis* occurs only in widely disjunct localities in Mississippi, Alabama, and Tennessee; in Louisiana and Alabama, the scattered populations occur mostly in prairie patches. Bonafide records seen in the present study are documented here. **Mississippi**. Monroe Co: ca. 3 mi SSW of Prairie along Hwy 25, 2.4 mi S of jct with Hwy 382, 7 May 1996, *McDonald 9364* (VDB); ca. 1.5 mi SW of Aberdeen, remnant prairie roadside at jct state hwys 25 and 382, 23 May 1996, *McDonald 9466* (BAYLU). Oktibbeha Co.: Botanic Garden of the South, ca. 1.5 mi S of Sessums on Sessums Rd, Black Prairie region, 21 May 1997, *Leidolf 1512* (VDB). **Alabama**. Sumter Co.: Blackland prairie between Gainesville and Alabama 17, 20 May 1975, *Kral 55614* (VDB). **Tennessee**. Warren Co.: 1 mi NE of Morrison, ballast of railroad adjacent swamp and Hwy 55, 18 May 1987, *Patrick & Wofford 2029* (SMU).

Spermolepis inermis probably is not native in Maryland, where it has been reported (Brown & Brown 1984). Radford et al. (1968) noted its occurrence in New Hanover Co., North Carolina, but no voucher exists in the NCU herbarium (Alan Weakley, pers. comm.). Some Alabama collections at VDB previously identified as *S. inermis* are instead *S. divaricata* (Baldwin Co., *Lelong 7712*; Dallas Co., *Sessler 1178*; Geneva Co., *Kral 90807*), and this mistaken identity probably also has been the case for the Maryland and North Carolina reports.

Additional specimens examined (outlying populations). **USA. New Mexico.** Eddy Co.: Carlsbad Caverns Natl. Park, 1.8 mi WSW of E boundary via sewage lagoon road, 0.7 mi E of sewage lagoons, small arroyo lined with shrubs, on bajada escarpment, 3650 ft, 19 Apr 1977, *Burgess 4496* (TEX); Carlsbad Caverns Natl. Park, Walnut Canyon, ca. 0.2 mi S, 0.2 mi W of BM 3901, gravel alluvium dominated by *Brickellia laciniata*, 17 May 1977, *Burgess 4556* (ARIZ, TEX). **MEXICO. Coahuila**. Rio Grande, Tule Canyon, on Coahuila side above Upper Madison Falls, calcareous gravelly soil, *Dasylirion*, *Yucca*, *Nolina*, *Rhus*, *Acacia*, 475 m, 10 Apr 1973, *Johnston et al. 10615* (LL); San Rosendo Canyon (flows into Rio Grande opposite Brewster Co.), 500-700 m, calcareous gravelly loam, *Dasylirion*, *Yucca*, *Nolina*, *Larrea*, *Acacia*, *Quercus*, *Prosopis*, 9 Apr 1973, *Johnston et al. 10597B* (LL); Musquiz, spring 1935, *Marsh 113* (TEX); Sierra de Santa Rosa, Canon El Puerto, Rancho El Puerto, 28 24 N, 101 54 W, matorral de *Acacia coulteri*, *Pithecellobium pallens*, *Zanthoxylum fagara*, *Yucca thompsoniana*, y *Opuntia lindheimeri*, 900-1000 m, 6 Jun 1991, *Villarreal 5963* (BRIT); Mpio. Musquiz, Hacienda La Rosita, 26 Jun 1936, *Wynd & Mueller 295* (ARIZ).

Fruits of a collection from south-central Texas, identifiable as *Spermolepis inermis* in every other way, have some tubercles producing very short, blunt-tipped hairs, similar to those of *S. organensis* and *S. infernensis*. Wilson Co.: 8 mi S of Elmendorf, 4 May 1945, *Cory 48795* (SMU).

Spermolepis inermis, *S. divaricata*, *S. diffusa*, *S. laevis*, and *S. organensis* appear to be closely related among themselves. If the ancestral species of *Spermolepis* had hairy fruits with (e.g., *S. echinata*, *S. gigantea*), then *S. inermis* can be understood as derived through loss of the hairs. *Spermolepis laevis* probably is a derivative of *S. inermis*, through further loss of the surface ornamentation of the fruits. *Spermolepis divaricata* and *S. diffusa* perhaps are sister species, through reduction of the inflorescence from an ancestor shared with *S. inermis* (maintaining the potential to produce fruit hairs). *Spermolepis organensis* is possibly a peripheral isolate of *S. inermis*; its short, stubby fruit hairs are like those of *S. infernensis* and rare populational forms of *S. inermis*, perhaps through partial derepression of the hair formation.

6. Spermolepis laevis G.L. Nesom, **sp. nov.** **TYPE: USA. Texas**. Llano Co.: Enchanted Rock, granitic sandy soil, 15 May 1933, *E. Whitehouse 11292* (holotype: SMU)

Similar to *Spermolepis inermis* in general appearance, especially its strictly pedunculate, terminal and axillary umbels and its relatively short, suberect and evidently clustered fruiting rays; different in its completely smooth fruit surface, with evident ribs but lacking tubercles on the ribs or intervals.

Stems 8–48 cm. **Leaves**: blades ovate to broadly ovate in outline, 1–4 cm, 3-pinnately compound, ultimate divisions filiform, 4–15(–25) mm; petioles 2–15 mm. **Peduncles** 2–5 cm. **Umbels** terminal and axillary, all pedunculate; involucre bracts 0 or very rarely 1–2; involucel bractlets 1–4, linear to linear-oblong or linear-lanceolate, 1–3(–5) mm, margins scabrous-toothed; fruiting rays 3–8, suberect and evidently clustered, unequal, (0–)2–9(–13) mm (central umbellet sessile to subsessile); umbellets (1–)3–8-flowered; fruiting pedicels (0–)3–5 mm (central flowers sessile to subsessile). **Schizocarps** 1–1.2 mm, minutely beaked, surface smooth, dorsal ribs 3, oil tubes 1 per dorsal interval. **Chromosome number** not reported. Map 3. Figure 14.

Flowering Apr–May(–Jun). Granite outcrops, granitic gravel, limestone gravel, sandy fields, oak-cedar slopes, live oak savannas; 200–500 m; Okla., Tex.

Additional collections examined. **Oklahoma**. Johnston Co.: 10 mi N of Tishomingo, near Wapanucka Road jct, grazed prairie along State Hwy 99, sandy granitic soil from nearby granite knobs, 29 May 1948 [fruit], *Robbins 3064* (UC). **Texas**. Bell Co.: nature prairie near Little River, 5

Jun 1930, *Wolff 2201* (VDB); near Little River, field, 11 May 1930, *Wolff 2102* (BRIT); Temple, from around Substation #5, 11 May 1930, *Wolff 2102* (SMU, perhaps duplicate of the BRIT sheet of same number). Burnet Co.: Granite 'hills'[?], sandy soil, 29 May 1922, *Tharp s.n.* (TEX); near Burnet, sandy soil, 26 Apr 1931, *Whitehouse 11291* (SMU); Inks Lake State Park, ca. 1 mi S of Hwy 29, granite outcrop, 1 May 1947, *Whitehouse 18439* (SMU). Gillespie Co.: ca. 12 mi N of Fredericksburg, dry soil on oak-cedar slope, 29 Jun 1957, *Correll & Johnston 17269* (LL). Hamilton Co.: [no other locality data], 12 Jun 1941, *Tharp s.n.* (TEX). Llano Co.: [no other locality data], 11 Jun 1930, *Tharp s.n.* (TEX). Mason Co.: Mason Mountain Wildlife Management Area, in Middle Pasture, 0.2 mi N of Mile-O-More Lake, 23 Apr 2001, *Sanchez 2355* (BAYLU); MMWMA, in Middle Pasture, near the Lodge, near Una Branta Lake, 19 Apr 2003, *Sanchez 3224* (BAYLU); MMWMA, in West Pasture, downstream from Comanche Lake, near the Beaver Dam, sandy soil, 15 Apr 2005, *Sanchez 3697* (BAYLU); Mason Mountain Wildlife Management Area, in Middle Pasture, 0.9 mi NE of gate into Headquarters Pasture, sandy soil, 29 May 2005, *Sanchez 3879* (BAYLU, BRIT); MMWMA, in Middle Pasture, 0.3 mi NE of Headquarters Bldg., live oak savanna, sandy soil, 17 May 2008, *Hansen 5922* (BAYLU, TEX); granite outcrops on S side of RM 1222, 2.6 km E from intersection of US Hwy 87 and RM 1222 at Camp Air, frequent in dry crevice, 17 May 1979, *Walters 301* (SMU). Tarrant Co.: near Fort Worth, in old field, 15 Jul 1924, *Ruth 1107* (SMU); gravel road N of Crowley under Santa Fe bridge, limestone gravel soil, Grand Prairie, 21 Apr 1946, *Whitehouse 15491* (SMU).

The Oklahoma collection (Johnston Co.) consists of 5 plants — 3 are typical *Spermolepis echinata* but 2 are typical *S. laevis*, the fruits completely glabrous.

From Bell Co., Texas, *Wolff 2201* has perfectly smooth fruits; fruits of Wolff 2102 (Fig. 1o) are very slightly tuberculate but better identified as *Spermolepis laevis* than *S. inermis*; *Wolff 657* (BRIT) from Bell Co., however, is clearly *S. inermis*. Both taxa have been collected in Bell, Burnet, Gillespie, and Tarrant counties. Field study toward a better understanding of the distribution of *Spermolepis laevis* and its biology, especially its possible interaction with *S. inermis*, will be interesting and useful.

7. **Spermolepis organensis** G.L. Nesom, **sp. nov.** **TYPE: USA. New Mexico**. Dona Ana Co.: Organ Mts., Rock Springs Canyon, NWNW Sec 34, T22S, R4E, common on gravelly loamy granitic soil on 5 deg N-facing slope, with *Quercus arizonicus*, *Juniperus deppeana*, *Garrya wrightii*, *Cercocarpus montanus*, *Rhus trilobata*, 5400 ft, 6 Jun 1995, *L. McIntosh 3106* (holotype: NMC!).

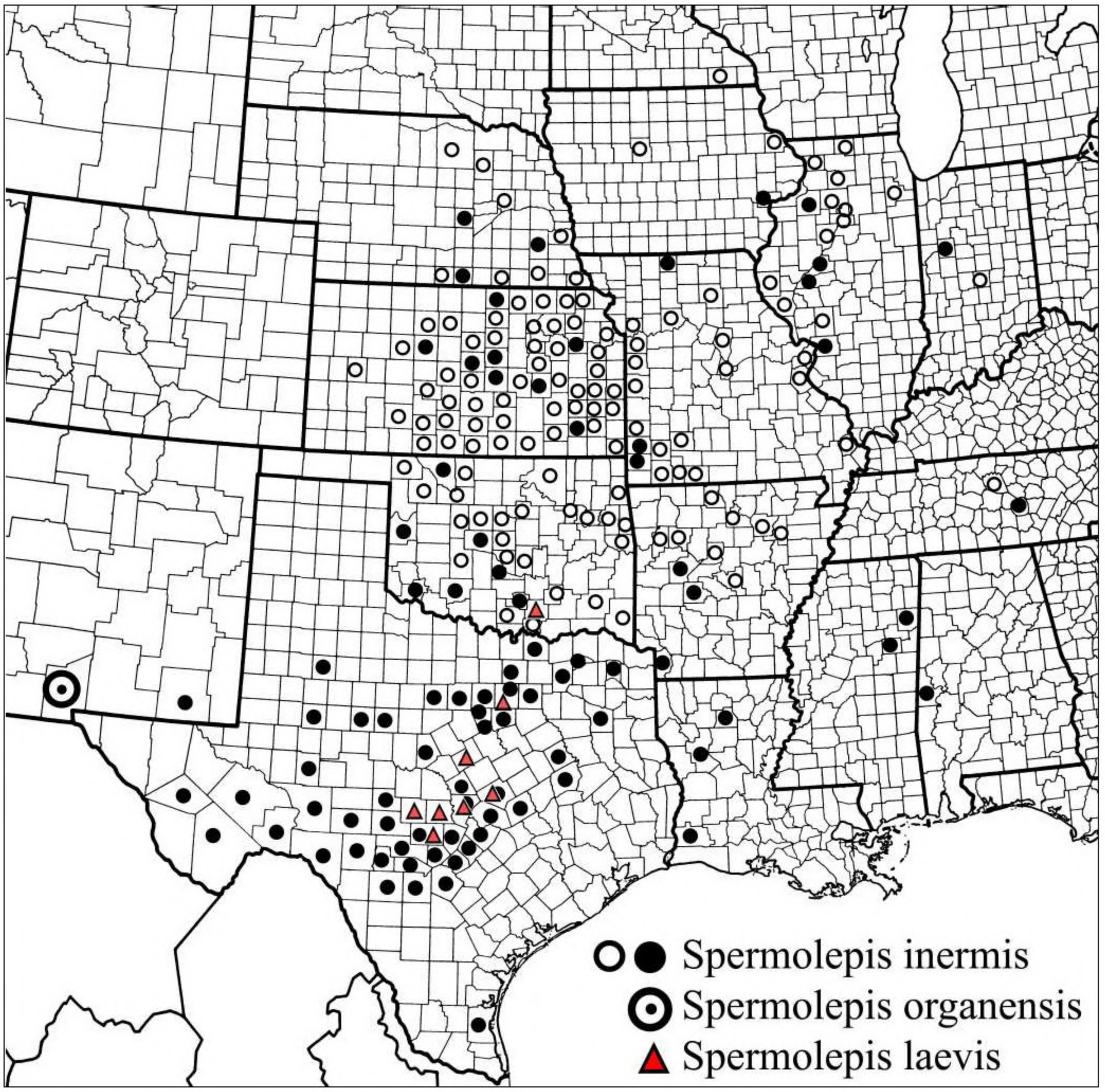
Similar to *Spermolepis inermis* in its strictly pedunculate, terminal and axillary umbels; different in its shorter fruiting peduncles and in its corky fruit surface with vaguely formed tubercles, some tubercles producing short, straight hairs, some without hairs.

Stems ca. 20 cm, purple. **Leaves**: blades broadly ovate in outline, 1.5–2 cm, 2–3 ternately compound, ultimate divisions filiform, 4–11 x 0.1 mm; petioles 2–8 mm. **Peduncles** 0.9–3.5 cm. **Umbels** terminal and axillary, all pedunculate, indeterminate; involucre bracts absent; involucel bractlets 1–4, margins smooth, 1–3 mm; fruiting rays 4–7, suberect and clustered, unequal, (0–)4–10 mm (central umbellet sessile); umbellets (3–)4–6-flowered, fruiting pedicels (0.2–)1–4 mm (central flowers sessile to subsessile). **Schizocarps** 1.2–1.5 mm, dorsal ribs 3, rounded, often somewhat obscured by the corky epidermis, lateral ribs similar to dorsal, oil tubes 1 per dorsal interval; surface with vaguely formed multicellular tubercles and/or rounded lateral ridges, tubercles sometimes with a straight, erect, blunt-tipped unicellular hairlike cell. **Chromosome number** not reported. Map 3. Figure 12.

Flowering May–Jun. Granitic gravelly loam, oak-juniper slopes; 1800 m; N.Mex., known only from the type collection.

The distinctive features of *Spermolepis organensis* might be interpreted as derived from those of *S. inermis*. The peripheral geographic location of *S. organensis* (Map 3) also suggests that this might be true but other outlying populations of *S. inermis* exist. Recognition of *S. organensis* as a species, albeit it weakly defined, emphasizes the apparent, at least partial derepression of the fruit hair formation, the corky fruit surfaces, and the relatively short fruiting peduncles.

If *S. organensis* were interpreted as of hybrid origin from extant parents, the only other species of *Spermolepis* currently known from the Organ Mountains is *S. lateriflora*. The nearest known occurrence of *S. inermis* is to the east in Eddy Co., that also somewhat of a geographic isolate.



Map 3. Distribution of *Spermolepis inermis*, *S. laevis*, and *S. organensis*. Open symbols are from literature and various sources; vouchers seen for others outside of Texas but not recorded.

8. Spermolepis divaricata (Walt.) Raf., Bull. Bot., Genève 1: 217. 1830. *Daucus divaricatus* Walt., Fl. Carol., 114. 1788. *Ammi divaricatum* (Walt.) Pers., Syn. Pl. 1: 308. 1805. *Aethusa divaricata* (Walt.) Spreng., Pl. Umbell. Prodr., 22. 1813. *Sison divaricatum* (Walt.) Spreng., Sp. Umbell., 113. 1818. *Leptocaulis divaricatus* (Walt.) DC., Coll. Mem. 5: 39. 1829. *Babiron divaricatum* (Walt.) Raf., New Fl. 4: 24. 1836. *Apium divaricatum* (Walt.) A.W. Wood, Amer. Bot. Fl., 140. 1870. **NEOTYPE** (Ward 2008, p. 475): **USA. South Carolina.** Charleston Co.: Wadmalaw Island, S of Charleston, 27 May 1988, *D. Boufford & E. Wood 23862* (GH; isoneotypes: MO, NY).

Walter did not cite a specimen or locality; Ward (2008) noted that "Spm. 40-C, a wispy fragment, was labeled "Daucus" by Fraser, and annotated as "divaricatus Walt." by A. Gray, though one wonders what he saw that was recognizable."

Sison pusillum Michx., Fl. Bor.-Amer. 1: 168. 1803. *Ligusticum pusillum* (Michx.) Pers., Syn. Pl. 1: 315. 1805. **TYPE: USA.** [protologue] "In sabulosis aridis Carolinae," *A. Michaux*? (holotype: P?).

Babiron dichotomum Raf., New Fl. 4: 24. 1838. **TYPE: USA. Florida.** Rafinesque did not cite a specimen, noting only "Florida." As synonym of *S. divaricata* fide Mathias and Constance (1944).

Babiron pusillum Raf., New Fl. 4: 23. 1838. **TYPE: USA.** Alabama or Georgia. Rafinesque noted "sent me from Alabama, and by Dr. Torrey from Georgia as the *Daucus pusillus*! see 788." As synonym of *S. divaricata* fide Mathias and Constance (1944).

Stems 7–40 cm. **Leaves**: blades oblong to oblong-ovate in outline, 0.5–5 cm, 3-pinnately compound, ultimate divisions linear, 3–10(–15) x 0.2–1 mm; petioles 1–30 mm. **Peduncles** 17–40(–50) mm. **Umbels** terminal and axillary, all pedunculate; involucre bracts absent; involucel bractlets 1–3, narrowly lanceolate, 0.5–1 mm, the margins usually callous-toothed; rays 3–6, divaricately spreading, unequal, 5–17 mm; umbellets (3–)4–6-flowered; fruiting pedicels (0–)2–9 mm (central 1–2 flowers subsessile to sessile). **Schizocarps** 1.5–2 mm, scabrous with minute, upcurved hairs not arising from a tuberculate base. **Chromosome number**: see comments below. Map 4. Figure 15.

Flowering Mar–Apr(–May). Sandy woodlands (longleaf pine-turkey oak, pine-oak, oak scrub, flatwoods, evergreen scub oak), prairie remnants, sandy peat, sandy roadsides, fields, pastures, and clearings, lawns, abandoned gardens, orange groves, moist ditches, swamp and salt marsh edges, shell mounds, sand ridges, sandhills, sand prairies, sandy peat of bogs; 0–200 m; Ala., Fla., Ga., La., Miss., N.J., N.C., S.C., Tex., Va.

Confusion exists regarding chromosome numbers of *Spermolepis divaricata*, *S. inermis*, and *S. echinata*. Numbers of $2n = 22$ and $2n = 16$ apparently both are based on vouchers both identified as *S. divaricata*. Vouchers for both counts were collected in Florida, so at least it is clear that neither could have been the basis of a count for *S. inermis*. The count of $2n = 20$ for *S. echinata* was made from an Arkansas plant (see description of *S. echinata*) securely identified as that species. While it seems unlikely that *S. divaricata* has two such distinct dysploid numbers, the possibility opens an interesting evolutionary study.

$2n = 22$ (Bell & Constance 1957; **Florida**. Okaloosa Co.: roadside banks just E of bridge 3.6 mi W of Crestview, 17 Apr 1954, *Bell 1470*, NCU [fide A. Weakley], VDB!, "Voucher for chromosome count of $n = 11$" on specimen). Initially identified by Bell as *Spermolepis divaricata*; annotated as *S. inermis* by Mathias & Constance and reported in publication as *S. inermis* with $n = 11$; later annotated by H.E. Ahles and by Alan Weakley as *S. divaricata*; confirmed by Weakley (pers. comm.) as *S. divaricata*.

$2n = 16$ (Bell & Constance 1957; **Florida**. Escambia Co.: sandy roadside along Fla. Hwy 297, 5 Apr 1955, *Bell 1514*, NCU [fide A. Weakley], "Voucher for chromosome count of $n = 8$" on specimen).

Initially identified by Bell as *Spermolepis echinata* and reported in publication as *S. echinata* with *n* = 8 in the Bell and Constance publication. Specimen later annotated by Mathias & Constance and by Alan Weakley as *S. divaricata*; confirmed by Weakley, pers. comm., as *S. divaricata*.

Attributions of the species to New Mexico have been based on misidentifications of *Cyclospermum leptophyllum*. PLANTS Database attributes *Spermolepis divaricata* to New Jersey, based on an unpublished "Chrysler Herbarium Checklist" (Rutgers University) by J. Meyer from 1990. The voucher, correctly identified in the checklist, is this: **New Jersey**. [Camden Co.]: Camden, ballast, 26 Jun 1866, *C.F. Parker s.n.* (CHRB digital image!). The species is regarded here as a waif in New Jersey and not a permanent member of the state flora.

The plants of *Spermolepis divaricata* from Acadia Parish, Louisiana, from prairie remnants along a railroad right-of-way, have pedicels in the upper range of length (mostly 5–9 mm) for the species but the central flowers of each umbellet are subsessile and fertile. Acadia Par.: along RR ca. 3.5 mi SW of Crowley, 7 May 1966, *Lemmon 1168* (LSU digital image!).

Two collections of *Spermolepis divaricata* are recorded here for Texas. Austin Co.: Industry, 1895, *Mr. H. Wurzlow s.n.* (BRIT). Liberty Co.: along Co. Rd 2252 W of the Davis Hill Baptist Church and N of Hwy 105 E of Cleveland, 26 Apr 1997, *Brown 20285* [without fully mature fruits but the pedicels are short and the umbellets have sessile central flowers with evidently maturing fruits] (NLU).

The difference between *Spermolepis divaricata* and *S. inermis* can be subtle but is nevertheless real. Before full fruit maturation, outgrowths of the ovary surface of *S. divaricata* can look like developing tubercles of *S. inermis* although they usually have an antrorse orientation. This similarity perhaps was the basis for the Mathias & Constance annotation of *Bell 1470* (as *S. inermis*; see comments above about chromosome numbers), which has short hairs and some tuberculate bases without hairs. In *S. inermis*, the central rays are consistently very short and there is a relatively small angle of divergence, overall giving the umbels a congested appearance. In *S. divaricata*, the rays (including the central) mostly are equal to subequal in length and diverge at a relatively greater angle, giving the umbels a more open appearance.

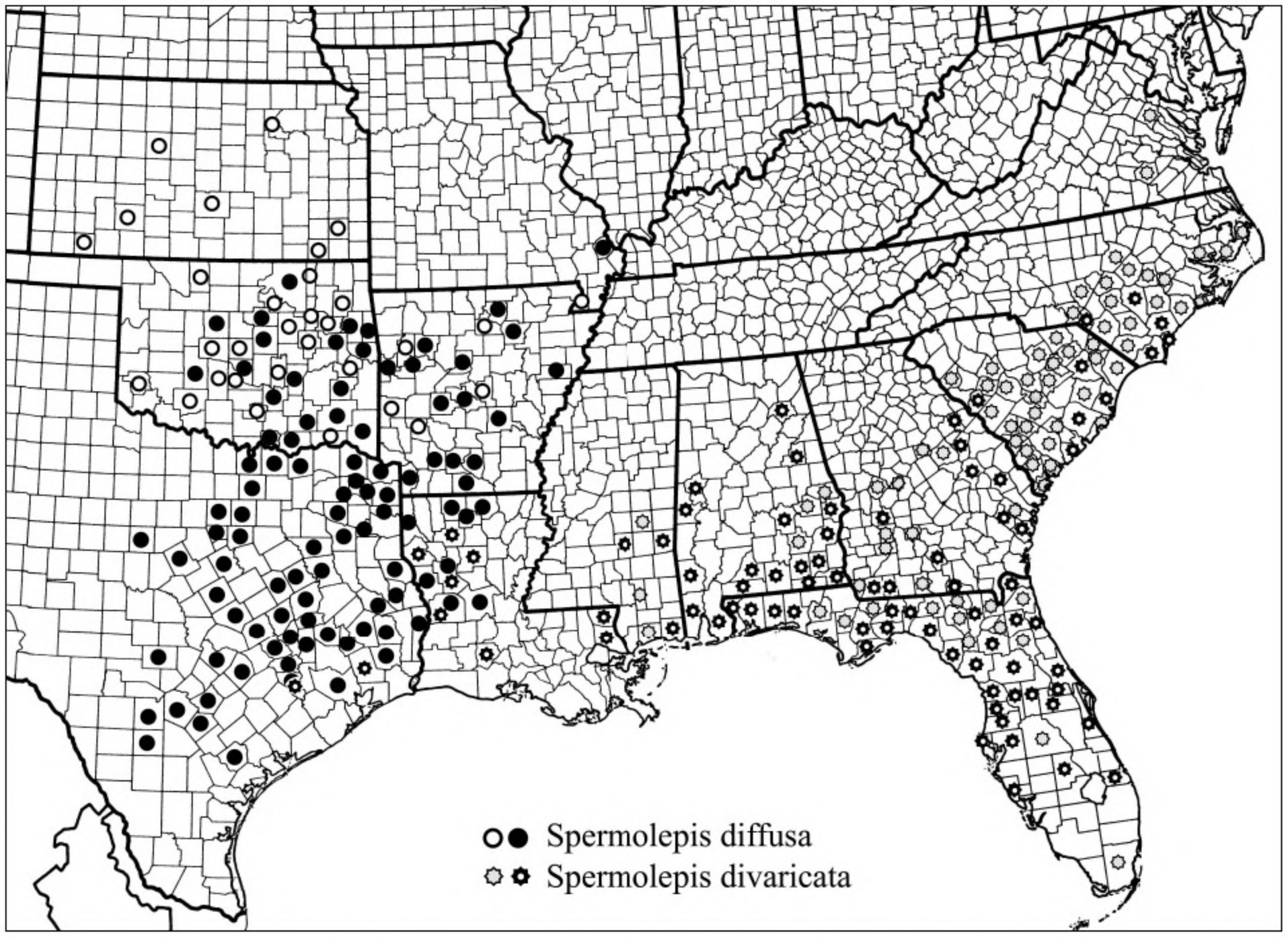
Spermolepis divaricata and *S. diffusa* characteristically produce a determinate inflorescence – – the axillary bud and terminal leaf are suppressed at the distalmost node (Fig. 2B). In some plants from Florida, however, this apparent specialization is not expressed (de-repressed?) and the pattern is determinate (Fig. 2A). These apparently are populational variants. Examples: Alachua Co.: *Dunn 525* (FLAS), *Kabat 488* (FLAS, 9 plants, 2 determinate, 9 indeterminate), *Scudder 1491* (FLAS). Baker Co.: *West & Arnold s.n.* (FLAS). Hernando Co.: *Nee et al. 2798* (FLAS). Highlands Co., *Baltzell 1799* (FLAS, 2 plants, 1 determinate, 1 indeterminate).

9. **Spermolepis diffusa** (Nutt. ex DC.) G.L. Nesom, **comb. nov.** *Leptocaulis diffusus* Nutt. ex DC., Prodr. 4: 107. 1830. **LECTOTYPE** (designated here): **USA. Arkansas**. "In Amer. bor. ad Red-River" [protologue], *T. Nuttall s.n.* (BM 001042884 digital image!; isolectotypes: BM 001042883 digital image!, NY digital image!, PH-2 sheets digital images!).
De Candolle noted ("v.s.") that he had seen the Nuttall collection.

Stems 15–75 cm. **Leaves**: blades oblong to oblong-ovate in outline, 0.5–5 cm, 3-pinnately compound, ultimate divisions linear, 3–15 x 0.2–1 mm; petioles 1–30 mm. **Peduncles** 20–50 mm. **Umbels** terminal and axillary, all pedunculate; involucre bracts absent; involucel bractlets 1–3, linear-lanceolate, 0.5–1 mm; fruiting rays 2–4(–6), divaricately spreading, subequal, 15–33 mm; umbellets 2–4(–5)-flowered; fruiting pedicels (8–)14–32 mm (all flowers of each umbellet with subequal

pedicels, none sessile or subsessile). **Schizocarps** 1.5–2 mm, scabrous with minute, upcurved hairs not arising from a tuberculate base. **Chromosome number** not reported. Map 4. Figure 16.

Flowering Apr–May(–Jun). Sandy clay, sand, roadsides, fencerows, fields, pastures, dunes and sandy hills, thin soil under oak-juniper, sandy soil in longleaf pine, pine, oak-pine, oak-hickory, post oak, and post oak-blackjack oak woods, lake shores; 50–500 m; Ark., Kans., La., Mo., Okla., Tex.



Map 4. Distribution of *Spermolepis diffusa* and *S. divaricata.* Completely hollow symbols are from literature and other sources, vouchers not seen in the present study

Aptly named *Leptocaulis diffusus* has long lain in synonymy of *Spermolepis divaricata* but its morphological distinction from typical *S. divaricata* is easy to discern. The long pedicels and rays of *S. diffusa* usually provide ID-at-a-glance; if the pedicels are in the shorter part of the range, the lack of sessile or subsessile flowers provides a second criterion. The range of *S. diffusa* is entirely west of the Mississippi River. The two species appear to be sympatric in central Louisiana and southeastern Texas. Vouchers documenting the occurrence of both species in Natchitoches and Vernon parishes (Louisiana) are at NLU.

Plants in a few scattered Texas collections have abnormally short pedicels: Anderson Co., pedicels 8–11 mm, *Bridges & Kindscher 13731* (BRIT, TEX); Comanche Co., pedicels 6–10 mm, *Shinners 20078* (SMU). In the Anderson Co. collection, a low percentage of the umbellets produced a single central, subsessile flower that did not develop a mature fruit. These plants are within the geographic range of *S. diffusa* and are regarded here as populational variants of that species, perhaps reflecting ancestal (*S. divaricata*-like) characteristics.

The close similarity and probable sister relationship of *Spermolepis diffusa* to *S. divaricata* might be emphasized in treating the two as conspecific varieties. The course here emphasizes their distinction in morphology and geography (and by inference, ecology). Pointed field observations in their region of sympatry would be interesting, and a chromosome count for *S. diffusa* might provide evidence for an internal isolating mechanism, especially in view of the apparent lability in chromosome number within the genus.

10. Spermolepis castellanosii Pérez-Mor., Lilloa 5: 32, fig. 1. 1940. **LECTOTYPE** (designated here): **ARGENTINA. Prov. Rio Negro**. San Antonio Este, 21 Nov 1928, *A. Castellanos* (BA 28/1184). Pérez -Moreau cited three other collections — two from Neuquen (leg. Ragonese, Perez-Moreau) and one from Mendoza (leg. Ruiz Leal).

Stems ca. 4–8 cm tall, simple or few-branched mostly at nodes above the base. **Leaves**: blades broadly ovate in outline, 25–40 mm, ultimate divisions 4–8 mm, scaberulous on margins and nerves; petioles 7–10 mm, scarious-margined at base. **Peduncles** 20–50 mm. **Umbels** axillary, all pedunculate; involucre bracts absent or 1; involucel bractlets 3–4, linear-lanceolate, entire, 1.5–7 mm, unequal; fruiting rays 3–5, 1–15 mm (inner 1–2 umbellets short-pedicellate), spreading; umbellets 3–5-flowered; fruiting pedicels (1–)7–9 mm (inner flower short-pedicellate), loosely convex to irregular. **Schizocarps** oblong-ellipsoid, attenuate toward the apex, 3.2–5.3 mm, hispid-hirsutulous on the angles and intervals with narrowly triangular, straight, blunt-tipped hairs, dorsal ribs 3, rounded, lateral ribs not expanded; oil tubes 1 (rarely 2–3) per interval, 2 on the commissural face. $2n = 64$ (Constance et al. 1976; *Hunziker 12523*, Cordoba, Argentina). Figure 17.

Spermolepis castellanosii apparently is endemic to west-central Argentina. Pérez-Moreau (1940) cited collections from the provinces of Rio Negro, Neuquen, and Mendoza. The hexaploid chromosome count by Constance et al. (1976) was from Prov. Cordoba. Photos on Flickr by Joseph Fourier (2009) are from Prov. San Luis.

11. Spermolepis gigantea (Coulter & Rose) G.L. Nesom, **comb. nov.** *Ammoselinum giganteum* Coulter & Rose, Contr. U.S. Natl. Herb. 7: 89. 1900. **TYPE: USA. Arizona**. Maricopa Co.: mesas near Phoenix, 17 Jun 1882, *C.G. Pringle 28* (holotype: GH; isotypes: fragment JEPS digital image!, NY digital image!, US digital image!).

Ammoselinum occidentale Munz & Johnston, Bull. Torrey Bot. Club 52: 224. 1925. **TYPE: USA. California**. Riverside Co.: "Hayfields" [Hayfield pumping plant locality], Chuckwalla Valley, Colorado Desert, locally abundant in heavy soil of a dry basin under shrubs and in the open, 500 ft, 13 Apr 1922, *P.A. Munz & D.D. Keck 4930* (holotype: POM digital image!; isotypes: BM digital image!, JEPS!, UC!).

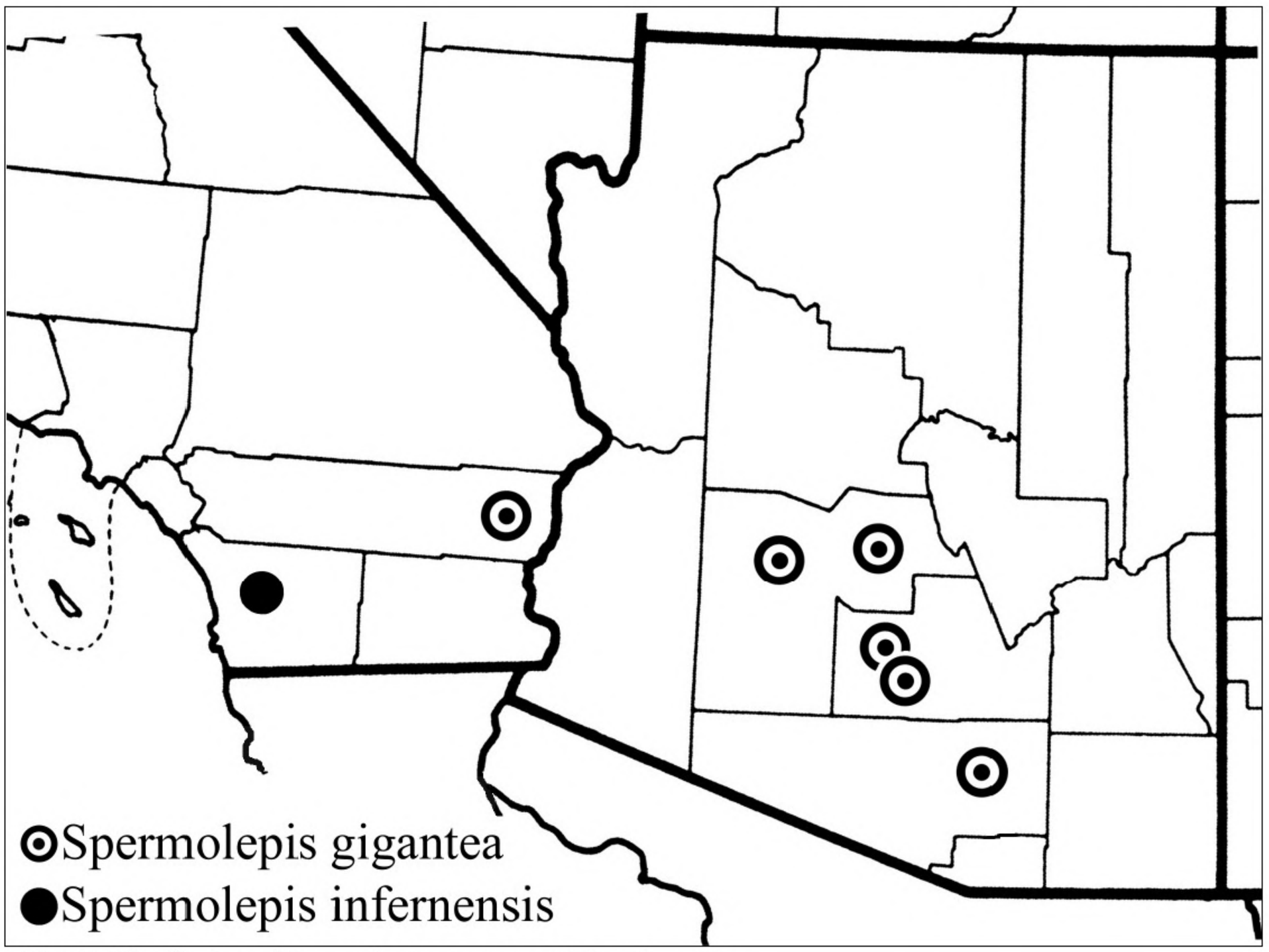
Stems 8–26 cm, simple or branching from the base. **Leaves**: blades obovate to broadly ovate in outline, 12–25 mm, ultimate divisions linear, (1–)4–13 mm; petioles 3–25(3–0) mm. **Peduncles** 2–5.5 cm or penultimate umbel sometimes sessile (see NY isotype, Fig. 19. **Umbels** terminal and axillary; fruiting rays 4–10, (0–)2–22 mm (inner umbellet sessile), unequal, spreading; umbellets 1–10 flowered; pedicels (0–)2–8 mm (inner flower sessile to subsessile); involucre bracts (0–)1–3, linear or sometimes 3-fid; involucel bractlets 1–6, linear to linear-lanceolate, entire or less commonly 2–3-fid, 2–12 mm, sometimes scarious-margined at base. **Schizocarps** narrowly elliptic-ovate to urceolate-oblong or ovoid-oblong, 3–4 mm, ribs low-rounded, hispid-hirsutulous on the ribs and intervals with sharp-pointed, 1–2-celled hairs arising from a conical, non-pustulate base, dorsal ribs 3, cordlike and thickened, lateral ribs flattened and broad, nearly obscuring the commissural sulca; dorsal oil tubes 3 per interval, commissural oil tubes 2. $2n = 38$ (from label of *McKay 64*: "$n = 19$ Chromosome vouchers cultivated in University of California Botanical Garden, C-775"). Map 5. Figures 18, 19, 20.

Flowering Mar–Apr. Roadsides, sandy flats, desert shrubland with *Larrea*; 200–800 m; Ariz., Calif.

Spermolepis gigantea is rare and represented in Arizona only by the collections cited here from Maricopa, Pima, and Pinal counties; in California it is known only from the type of *Ammoselinum occidentale*, collected in eastern Riverside County (Map 4). Wolff (1927) and Mathias and Constance (1945) identified *Pringle 8314* from Coahuila as *Ammoselinum giganteum*, but that collection, far-distant from the main range of that species, is identified here as typical *Ammoselinum popei* (see citation above).

Collections examined. **USA**. **Arizona**. Maricopa Co.: 39 mi NW of Wintersburg, sandy flat among *Larrea*, 22 Mar 1936, *Wiggins 8431* (UC). Pima Co.: ca. 10 mi E of Tucson on Nogales Road, on open roadside, 2500 ft, 27 Apr 1945, *Gould 3064* (ARIZ). Pinal Co.: near Casa Grande, 3 Apr 1937, *Darrow s.n.* (ARIZ); Casa Grande, 1400 ft, flrs faintly *Pastinaca*-scented, 2 May 1965, *McKay 64* (ARIZ); Eloy, 25 Mar 1930, *Peebles, Harrison, & Kearney 6496* (ARIZ-2 sheets).

Spermolepis gigantea is characterized by these features: umbels terminal and axillary, all pedunculate; involucel bractlets long, scarious-margined on the proximal 1/3–1/2; involucre bracts usually present, often ternate; peduncles, rays, and pedicels minutely hispidulous on the angles; and fruits relatively long, narrowly elliptic-ovate, hispid with non-pustulate-based hairs. The broad lateral ribs are perhaps the reason that is has been treated as a species of *Ammoselinum*.



Map 5. Distribution of *Spermolepis gigantea* and *S. infernensis*.

Munz & Johnston (1925) included *Ammoselinum giganteum* and *A. occidentale* as the two members of *Ammoselinum* sect. *Hesperoselinum* Munz & Johnston, but Mathias and Constance (1944, p. 104), without comment, placed *A. occidentale* in the synonymy of *A. giganteum*, where it has since resided. Munz and Johnston observed that *Ammoselinum occidentale* differed from *A. giganteum* in its "lower more compact habit, unbranched stems, smaller more compact umbels, pubescent (rather than conspicuously callous-toothed) smaller carpels, and twice as many commissural oil tubes." In the observation here, however, the fruit vestiture is the same in both taxa, and Mathias and Constance (1944) treated *A. occidentale* as a synonym of *A. giganteum*. Mathias and Constance described the lateral fruit ribs of *A. giganteum* as having "corky appendages," but in the observation here, they are elaborated hardly more than the dorsal.

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Figure 3. *Apiastrum angustifolium*, representative plant (ASU).

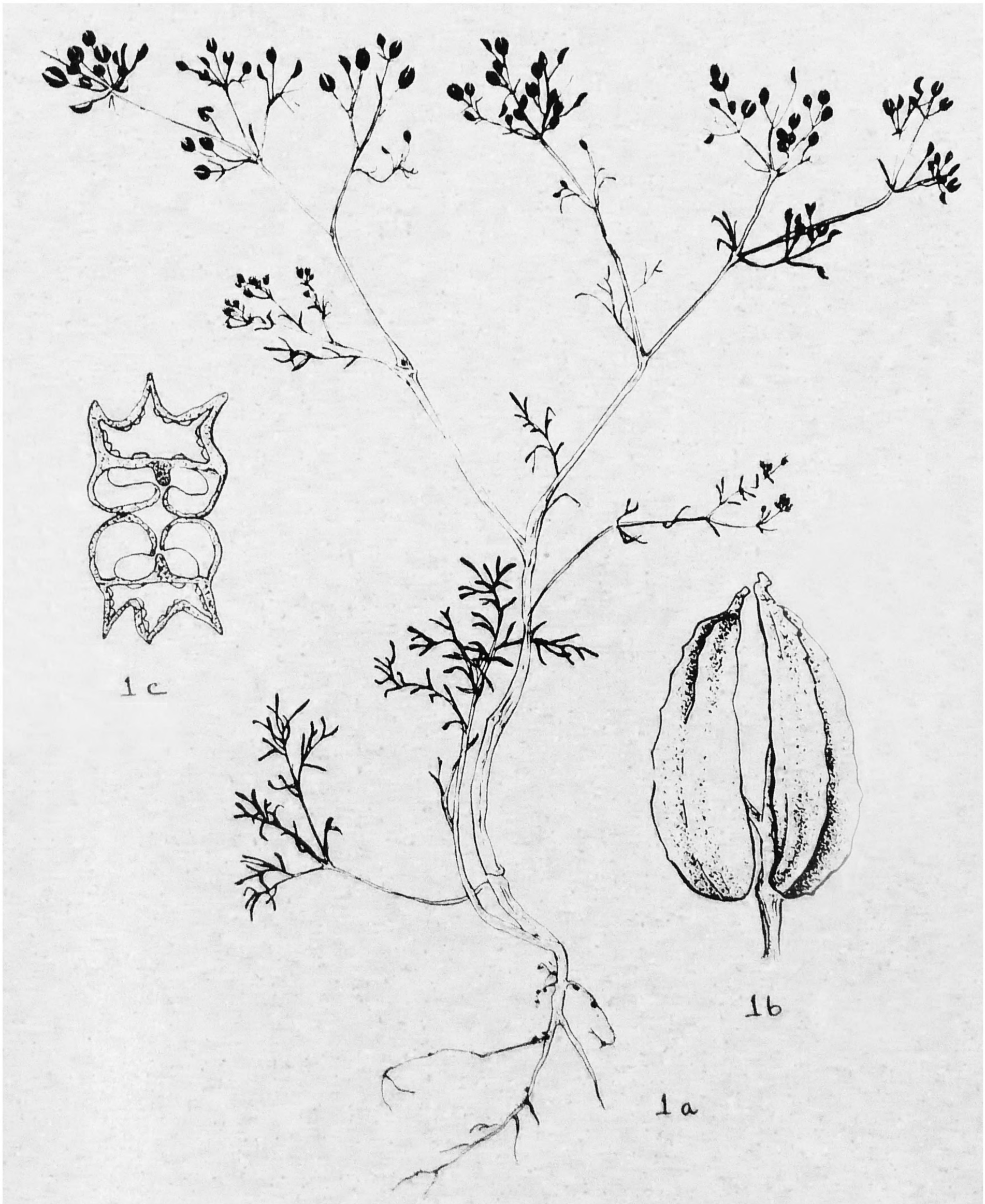

Figure 4. *Ammoselinum rosengurtii*, from original illustration (Mathias & Constance 1950). Used by permission of the Journal of the Torrey Botanical Society.

Figure 5. *Ammoselinum rosengurtii* (holotype, UC).

Figure 6. *Spermolepis lateriflora*, representative collection (ARIZ).

Figure 7. *Spermolepis lateriflora*, representative plant, bottom left of Fig. 5 (ARIZ).

Figure 8. *Spermolepis echinata*, representative collection (FSU).

Figure 9. *Spermolepis hawaiiensis*, epitype (PTBG). Used by permission of the National Tropical Botanical Garden.

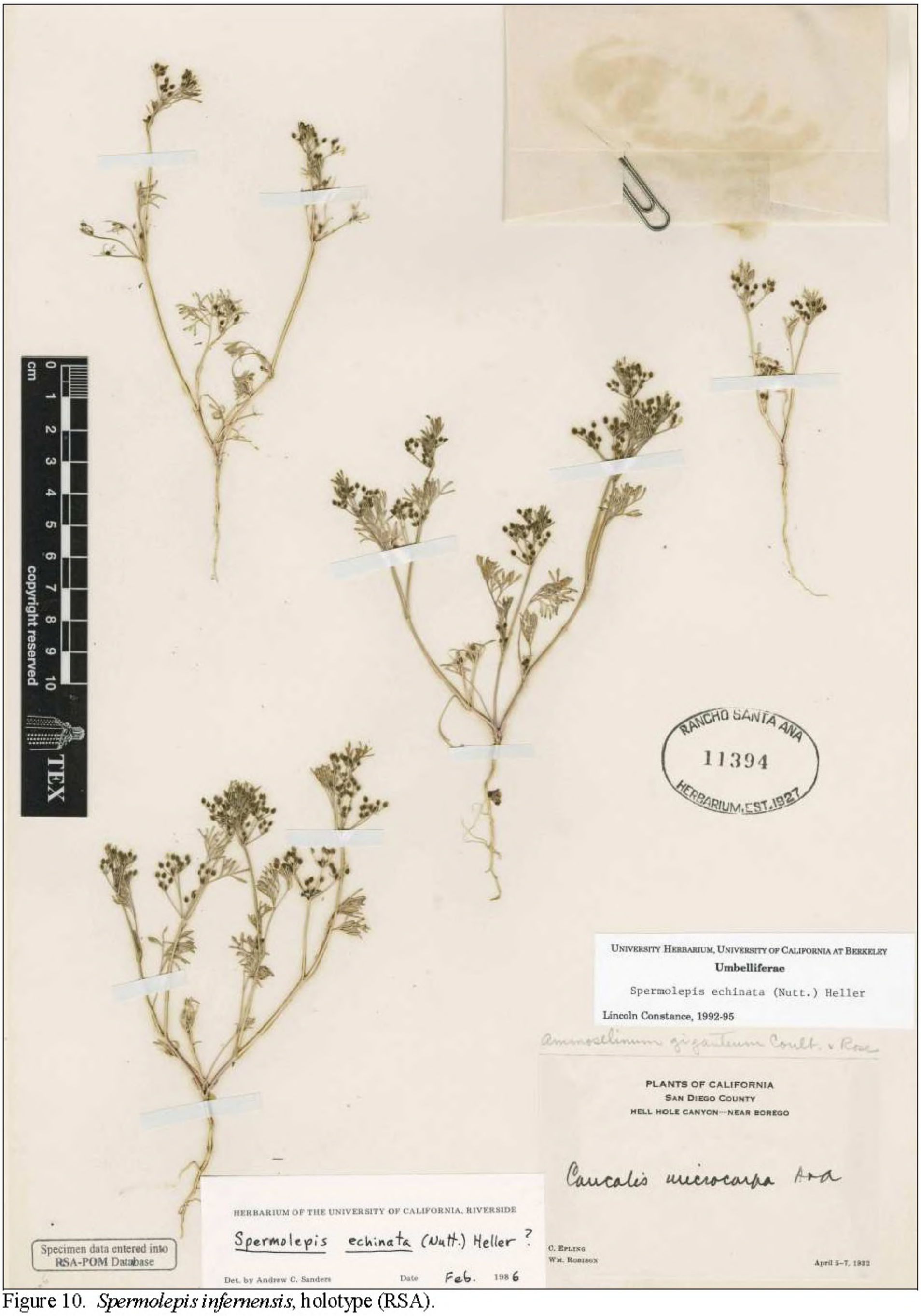

Figure 10. *Spermolepis infernensis*, holotype (RSA).

Figure 11. *Spermolepis infernensis*, representative plant (from holotype, RSA).

Figure 12. *Spermolepis organensis*, holotype (NMC).

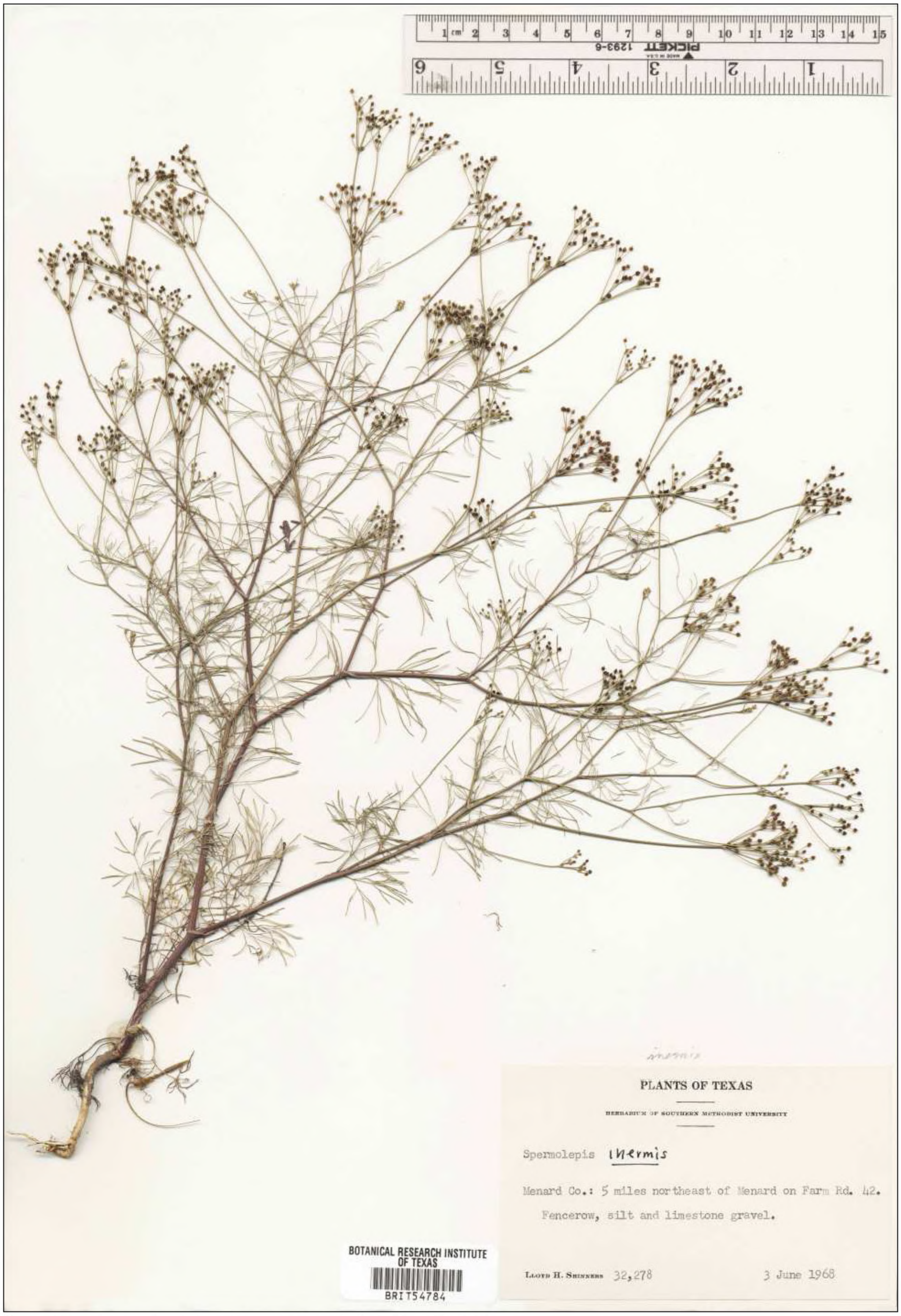

Figure 13. *Spermolepis inermis*, representative plant (SMU).

Figure 14. *Spermolepis lævis*, representative plant (SMU).

Figure 15. *Spermolepis divaricata*. representative plant (FSU).

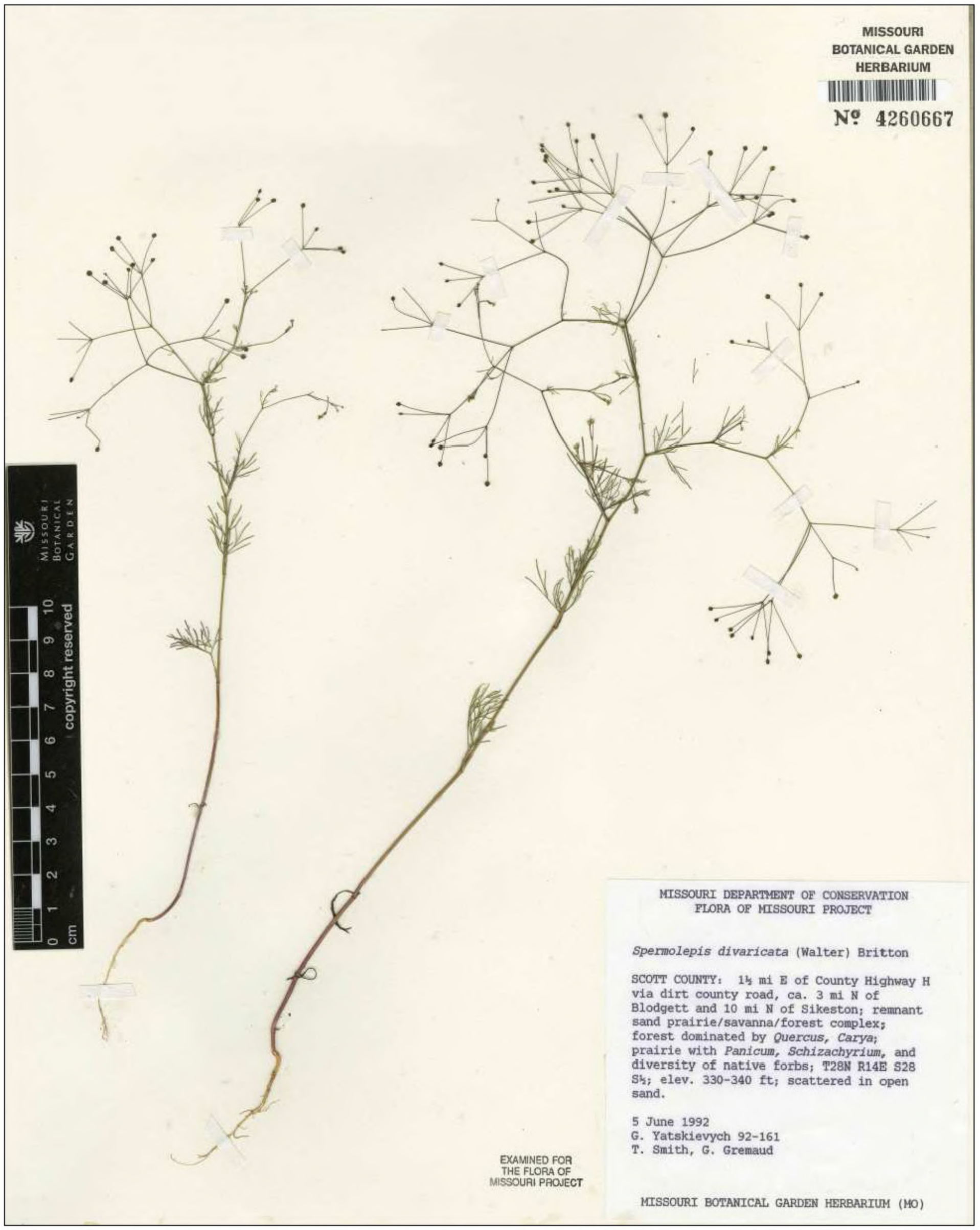

Figure 16. *Spermolepis diffusa*. representative plant (MO).

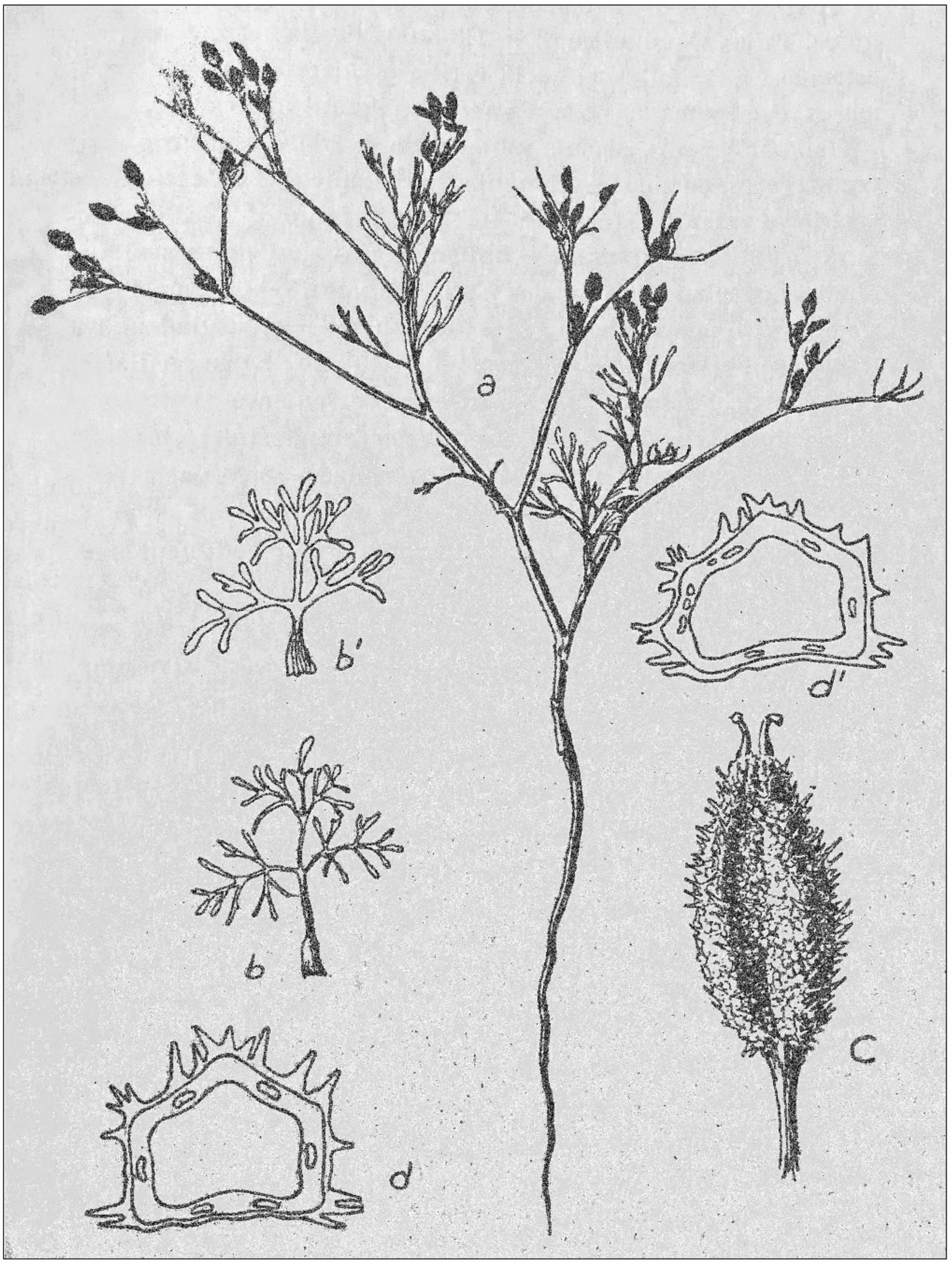

Figure 17. *Spermolepis castellanosii*, from the original illustration (Pérez-Moreau 1940).

Figure 18. *Spermolepis gigantea*, representative plants (ARIZ).

Figure 19. *Ammoselinum giganteum* isotype (NY) = *Spermolepis gigantea*.

Figure 20. *Ammoselinum occidentale* isotype (UC) = *Spermolepis gigantea*.